EXHIBIT 9

UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

12323 7590 09/24/2015

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

EXAMINER
RIOS RUSSO, RAUL J

ART UNIT	PAPER NUMBER
2867	

DATE MAILED: 09/24/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

TITLE OF INVENTION: FLEXIBLE TOUCH SENSOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	12/24/2015

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

12323 7590 09/24/2015
Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

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13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

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nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	12/24/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
RIOS RUSSO, RAUL J	2867	324-658000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

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ART UNIT	**PAPER NUMBER**
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DATE MAILED: 09/24/2015

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 2867	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *06/19/2015*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1, 2, 4, 6, 7, 10-12, 14, 16, 17 and 20-28*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Vincent Q Nguyen/
Primary Examiner, Art Unit 2866

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Response to Amendment

2. This is a response to Amendment/Req. Reconsideration-After Non-Final Rejection from RCE Request filed by Applicant on 06/19/2015.

3. Claims 1, 2, 4, 6, 7, 10-12, 14, 16, 17 and 20-28 have been allowed.

4. Claims 1 and 11 have been amended.

5. Claims 3, 5, 8, 9, 13, 15, 18 and 19 have been cancelled.

6. Claims 27 and 28 have been added.

Response to Arguments

7. ***Double Patenting Rejection:***

On Applicant's Response, filed on 06/19/2015, Applicants amended claims 1 and 11 in order to overcome the Double Patenting. After consideration, Examiner agreed that amendments would overcome the Double Patenting Rejection; thus the obviousness-type double patenting rejection has been withdrawn.

8. ***Claim Rejections Under 35 U.S.C. 103:***

Applicant's arguments, see pages 6-11, filed 06/19/2015, with respect to the rejection(s) of claims 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("Grant") in view of U.S. Patent Application Publication No. 2008/0158183 ("Hotelling"), U.S. Patent Application Publication No. 2010/0045614 ("Gray"), and U.S. Patent Application Publication No. 2009/0219257 ("Frey") have been fully considered and are persuasive.

REASONS FOR ALLOWANCE

9. The following is an examiner's statement of reasons for allowance:

10. Regarding **claims 1 and 11**, the prior art does not teach or suggest, in combination with the rest of the limitations of the claims,

"a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein; the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; and the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display."

11. Claims 2, 4, 6, 7, 10, 21-23 and 27 are also allowed as they further limit allowed claim 1.

12. Claims 12, 14, 16, 17, 20, 24-26 and 28 are also allowed as they further limit allowed claim 11.

13. The closest prior art of record is Drzaic et al. US 2013/0088671 which consists of an electronic device e.g. handheld electronic device such as laptop computer, has display layer coupled to printed circuit substrate using wire bond that passes through opening of display layer, where opening is formed in transistor layer.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Hamada et al. US 2007/0153548 - Backlight unit used in liquid crystal display device, includes light guide plate having scattering dots formed at surface which

opposes reflection sheet, for transmitting light emitted from light source to reflection sheet.

- Hamada et al. US 2008/0129927 - Backlight unit used in liquid crystal display device, includes light guide plate having scattering dots formed at surface which opposes reflection sheet, for transmitting light emitted from light source to reflection sheet

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Phan can be reached on (571)272-7924. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 2867

/Vincent Q Nguyen/

Primary Examiner, Art Unit 2866

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Esat Yilmaz
Serial No.:	13/284,674
Filing Date:	October 28, 2011
Art Unit:	2867
Confirmation No.:	7554
Examiner:	Raul J Rios Russo
Title:	FLEXIBLE TOUCH SENSOR

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE PURSUANT TO 37 C.R.F. § 1.111

In response to the Office Action dated March 19, 2015, Applicant respectfully requests that the Examiner reconsider the rejections of the claims in view of the following amendments and remarks. Please amend the application as follows.

In the Claims:

1. **(Currently Amended)** An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein:

the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; **and**

the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display.

2. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. (Canceled)

4. (Previously presented) The apparatus of Claim 1, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. **(Canceled)**

6. (Original) The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. (Original) The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. (Canceled)

9. (Canceled)

10. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. **(Currently Amended)** A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein:

the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid;

the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. (Original) The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. (Canceled)

14. (Previously presented) The device of Claim 11, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. (Canceled)

16. (Original) The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. (Original) The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. (Canceled)

19. (Canceled)

20. (Original) The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

21. (Previously presented) The apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another.

22. (Previously presented) The apparatus of Claim 1, wherein the first and second conductive lines are non-linear.

23. (Previously presented) The apparatus of Claim 1, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

24. (Previously presented) The device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another.

25. (Previously presented) The device of Claim 11, wherein the first and second conductive lines are non-linear.

26. (Previously presented) The device of Claim 11, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

27. (**New**) The apparatus of Claim 1, wherein the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display.

28. (**New**) The device of Claim 11, wherein the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display.

Remarks

This Application has been carefully reviewed in light of the Office Action dated March 19, 2015 ("Office Action"). Applicant appreciates the Examiner's consideration of the Application. At the time of the Office Action, claims 1-2, 4-7, 10-12, 14-17, and 20-26 were pending and remain rejected. To advance prosecution of this application, Applicant amends Claims 1 and 11 and cancels Claims 5 and 15. In addition, Applicant adds Claims 27-28, which do not add any new subject matter. Applicant does not admit that the amendments are necessary due to the cited references or any of the Examiner's rejections. Applicant respectfully traverses the rejections and requests reconsideration and allowance of all pending claims and consideration and allowance of all new claims.

Request for Subsequent Interview

If, in response to Applicant's present submission, the Examiner intends to issue a new Office Action rejecting some or all of the pending claims, in the interest of compact and efficient prosecution Applicant respectfully requests that the Examiner contact Applicant's attorney prior to issuing the new Office Action to discuss a possible resolution to any outstanding issues.

The Double Patenting Rejections

The Office Action provisionally rejects claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that claims 1-2, 7, 11-12, and 17 are otherwise allowable in their current form.

The Claims are Allowable over the Proposed *Grant-Hotelling-Gray-Frey* Combination

The Office Action rejects claims 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("*Grant*") in view of U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*"), U.S. Patent Application Publication No. 2010/0045614 ("*Gray*"), and U.S.

Patent Application Publication No. 2009/0219257 ("*Frey*"). The Office Action rejects the remaining claims under U.S.C. § 103(a) as being unpatentable over *Grant*, *Hotelling*, *Gray*, and other references. Applicant traverses these rejections and discusses amended independent Claim 1 below as an example.

First, Applicant respectfully submits that the proposed *Grant-Hotelling-Gray-Frey* combination fails to disclose, teach, or suggest, expressly or inherently, each feature of amended Claim 1. For example, the proposed *Grant-Hotelling-Gray-Frey* combination fails to disclose at least the following features recited in amended Claim 1 (emphasis added):

> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein:
>
> the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; and
>
> ***the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display.***

The Office Action points to ¶ [0008] of *Hotelling* as allegedly teaching a previous version of Claim 1. Office Action, p. 4. Whether or not those rejections were appropriate (and Applicant makes no admission that they were), the cited portions of *Hotelling* do not disclose, teach, or suggest "the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display," as recited in amended Claim 1. According to a cited portion of *Hotelling*:

> [0008] A multi-touch sensor panel can be created using a substrate with column and row traces formed on either side of the substrate using a novel fabrication process. ***Flex circuits can be used to connect the column and row traces on either side of the sensor panel to its associated sensor panel circuitry.*** Traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel. A single flex circuit can be fabricated to connect to the rows and columns on directly opposing sides at the same edge of the substrate. Furthermore, the row traces can be widened to shield the column traces from a modulated Vcom layer.

Hotelling at ¶ 8 (emphasis added). That is, while a cited portion of *Hotelling* may disclose flex circuits that connect column and row traces on either side of a sensor panel, it does not

disclose, teach, or suggest "the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display," as recited in amended Claim 1. The cited portions of *Grant*, *Gray*, and *Frey* do not appear to cure these deficiencies of *Hotelling*. Consequently, the proposed *Grant-Hotelling-Gray-Frey* combination fails to disclose, teach, or suggest each and every element of amended Claim 1.

Thus, for at least these reasons, amended independent Claim 1 and its dependent claims are allowable. For at least certain analogous reasons, amended independent Claim 11 and its dependent claims are allowable. Applicant therefore respectfully requests full allowance of all pending claims.

Second, Applicant respectfully submits that independent Claim 1 is additionally allowable at least because the proposed *Grant-Hotelling-Gray-Frey* combination fails to disclose, teach, or suggest, expressly or inherently, the following additional features recited in Claim 1 (emphasis added):

> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising ***drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate***, wherein:
>
> the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; and
>
> the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display.

The Office Action points to Figures 1, 2a, and ¶¶ 30-33 of *Hotelling* as allegedly teaching the emphasized portion of Claim 1 above. Office Action p. 4. However, in contrast to ***drive or sense electrodes*** made of flexible conductive material configured to bend ***with the substantially flexible substrate***, *Hotelling* merely discloses that "a single flex circuit can be fabricated to connect to the rows and columns on directly opposing sides at the same edge of the substrate." *Hotelling* at ¶ 30. Requiring an additional flex circuit to connect rows and columns on opposite sides of a substrate does not disclose "drive or sense electrodes made of flexible conductive material ***configured to bend with the substantially flexible substrate***," as recited by Claim 1.

Furthermore, at no point does *Hotelling* disclose sense traces or drive electrodes that "bend with the substantially flexible substrate" because at no point does *Hotelling* disclose a flexible substrate. This deficiency of *Hotelling* is reinforced in Figures 5 and 6:

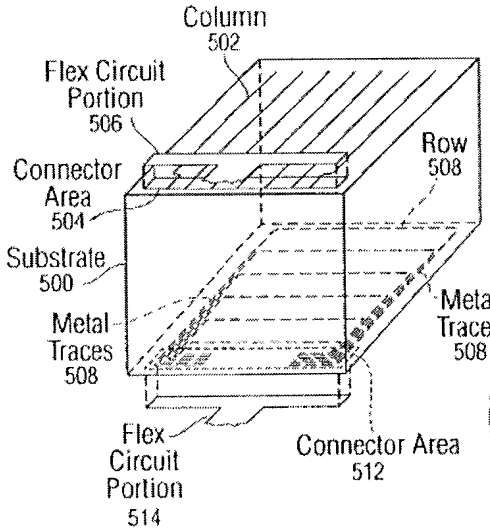


Fig. 5

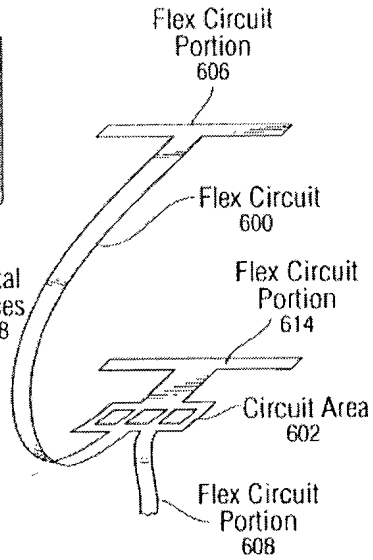


Fig. 6

Hotelling, Figs. 5 and 6. To the extent that the Office Action relies on the "Flex Circuit" elements of Figures 5 and 6 to allegedly disclose the emphasized portions of Claim 1 above, *Hotelling* explicitly states that the "[f]lex circuit can be used **to connect the column and row traces** on either side of the sensor panel to its associated sensor panel circuitry." *Hotelling* at ¶ 30 (emphasis added). Thus, the flex circuit elements *are not even* drive or sense electrodes. Accordingly, *Hotelling* fails to disclose "drive or sense electrodes [disposed on the substantially flexible substrate and] made of flexible conductive material configured to bend with the substantially flexible substrate," as recited by Claim 1. The cited portions of *Grant*, *Gray*, and *Frey* do not cure these deficiencies of *Hotelling*. Thus, the proposed *Grant-Hotelling-Gray-Frey* combination fails to disclose, teach, or suggest each limitation of Claim 1.

For at least these additional reasons, independent Claim 1 and its dependent claims are allowable. For at least certain analogous reasons, independent Claim 11 and its dependent claims are allowable. Applicant therefore respectfully requests full allowance of all pending claims.

New Dependent Claims 27 and 28 are Allowable

New Claims 27 and 28 depend from independent Claims 1 and 11, respectively, which Applicant has shown above to be allowable over the proposed *Grant-Hotelling-Gray-*

Frey combination. Accordingly, new dependent Claims 27 and 28 are allowable over the proposed *Grant-Hotelling-Gray-Frey* combination at least because they depend on allowable independent claims. Additionally, dependent Claims 27 and 28 recite further patentable distinctions over the proposed *Grant-Hotelling-Gray-Frey* combination. To avoid burdening the record and in view of the clear allowability of independent Claims 1 and 11, Applicant does not discuss these distinctions in this Response. However, Applicant reserves the right to discuss these distinctions in a future Response or on Appeal, if appropriate. For at least these reasons, new dependent Claims 27 and 28 are allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of all pending claims.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicant does not acquiesce to those additional statements.

Conclusion

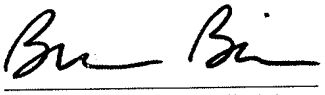
Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact Brad Birchfield, attorney for the Applicant, at 214-953-6570, at the Examiner's convenience.

Although Applicant believes no fees are due, the Commissioner is hereby authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of BAKER BOTTS L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

12323 7590 03/19/2015

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EXAMINER
RIOS RUSSO, RAUL J

ART UNIT	PAPER NUMBER
2867	

NOTIFICATION DATE	DELIVERY MODE
03/19/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 2867	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03/03/2015*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1,2,4-7,10-12,14-17 and 20-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,2,4-7,10-12,14-17 and 20-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/03/2015 has been entered.

Response to Amendment

3. This is a response to Amendment/Req. Reconsideration- Final Rejection filed by Applicant on 11/03/2014.

4. Claims 1, 2, 4-7, 10-12, 14-17 and 20-26 are pending.

5. Claims 1 and 11 have been amended.

6. Claims 3, 8, 9, 13, 18 and 19 have been canceled from Applicants' previous response of 06/26/2014.

Response to Arguments

Section 103 Rejection:

7. Applicant's arguments, see pages 7-10, filed on 03/03/2015, with respect to the rejection(s) of claim(s) 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("Grant") in view of over U.S. Patent Application Publication No. 2008/0158183 ("Hotelling") and further in view of U.S. Patent Application Publication No. 2010/0045614 ("Gray") have

been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Frey et al. (US 2009/0219257) in combination with the previously stated prior arts.

The Double Patenting Reiection:

8. On Page 6 of the Remarks, Applicants state regarding the provisionally rejected " Claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1-2, 7, 11-12, and 17 are otherwise allowable in their current form."

Examiner still maintains the double patenting rejection of claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646.

Claim Rejections - 35 USC § 103

9. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 2, 4-7, 10-12, 14-17, 20-22, 24 and 25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant et al. US 2008/0303782 A1 (previously cited and**

hereinafter Grant) in view of **Hotelling et al. US 2008/0158183 A1 (previously cited and hereinafter Hotelling),** in further view of **Gray et al. US 2010/0045614 (previously cited cited and hereinafter Gray)** and in further view of **Frey et al. US 2009/0219257 (Newly cited and Hereinafter Frey)**.

Regarding claim 1, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**.

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the row and column oriented conductors may be disposed on the same layer…;** See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines (rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

The combination of Grant, Hotelling and Gray does not specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid.

However, Frey does teach teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid **(Fig. 12; [0051, 0150]; mesh bars; Fig. 23; [0158]; [0060, 0101, 0117]** See also Yilmaz et al. US 2013/0032414; [0011-0021, 0029], claims 1 and 13).

It would have been obvious at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the mesh bars from the touch screen sensor taught by Frey in order to provide a mesh pattern with improved visibility by reducing diffraction, refraction diffused reflection and moire patterns (See Yu US 2012/0299865; paragraphs [0023, 0024]; Figs. 6a, 6b, [0073]).

Regarding claim 11, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**; as well as one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor

(Fig. 2; [0058]; Main memory 204, which may include multiple levels of cache memories, stores frequently used data and instructions. Main memory 204 may be RAM (random access memory), MRAM (magnetic RAM), or flash memory. Static memory 206 may be a ROM (read-only memory), which is coupled to bus 211, for storing static information and/or instructions).

Grant does not specifically teach the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising a plurality of capacitive nodes **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** formed from drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate; See also Grant: see at least Figs. 1A, 1C, and 1E).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher

voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the row and column oriented conductors may be disposed on the same layer…;** See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines (rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

The combination of Grant, Hotelling and Gray does not specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid.

However, Frey does teach teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another

at an intersection to form a mesh grid **(Fig. 12; [0051, 0150]; mesh bars; Fig. 23; [0158]; [0060, 0101, 0117]** See also Yilmaz et al. US 2013/0032414; [0011-0021, 0029], claims 1 and 13).

It would have been obvious at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the mesh bars from the touch screen sensor taught by Frey in order to provide a mesh pattern with improved visibility by reducing diffraction, refraction diffused reflection and moire patterns (See Yu US 2012/0299865; paragraphs [0023, 0024]; Figs. 6a, 6b, [0073]).

Regarding claims 2 and 12, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant does teach wherein the touch sensor **(see at least Figs. 1A-1C; [0009-0011])** further comprises tracking disposed on the substantially flexible substrate **(Figs. 3-4 and the corresponding descriptions; 302 and 310; [0060-0063])** configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3, 4 and the corresponding descriptions; 302 and 310; [0060-0063])**.

Grant does not specifically teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes.

However, Hotelling does teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections **([0005-0006, 0008]; Flex circuits can be used to connect the column (sense) and row (drive) traces on either side of the sensor panel to its associated sensor panel circuitry;** See also Gray; Fig. 2; [0063]) to or from the drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a**

first side of a dielectric substrate; and drive traces formed on a second side of the substrate; See also Gray; Fig. 2; [0063])

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces. Also, the columns must be connected to analog channels so that modulated output signals can be detected.

Regarding claims 4 and 14, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate;** See also Gray; Fig. 2; [0063])**.**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the

row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 5 and 15, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the substantially flexible substrate is flat or curved **(Grant; Fig. 3; 302; flexible touch sensitive surface; the flexible touch sensitive surface is flat)**.

Regarding claims 6 and 16, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

However, Hotelling does teach wherein the touch sensor comprises:

a single-layer configuration **(Fig. 9; [0056]; single layer configuration of ITO)** with drive and sense electrodes **(see at least Figs. 1 and 2a; [0030-0033]; claim 9; sense and drive traces)** disposed only on a first surface of the substantially flexible substrate **(see at least Figs. 1 and 2a; [0030-0033]**); or

a two-layer configuration **(Figs. 3, 9; [0043, 0056];top and bottom layer of ITO for Fig. 3; and a second layer configuration of ITO can be added for Fig. 9)** with drive electrodes (**see**

at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; drive traces) disposed on the first surface of the substantially flexible substrate **(Fig. 3; [0008, 0043]; claim 9; top layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** and sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces)** disposed on a second surface of the substrate opposite the first surface **(Fig. 3; [0008, 0043]; claim 9; bottom layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding the single-layer or double layer configuration as taught by Hotelling because layer configuration can be applied for the purpose of shielding, modulation and a uniform appearance.

Regarding claims 7 and 17, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor **([0071]; some touch surfaces detect inputs by measuring capacitance change in response to a touch; See also Hotelling; see at least Figs. 1-2; 124, 126; [0030-0033, 0035]).**

Regarding claims 10 and 20, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claims 1 and 11; where Grant does not specifically teach wherein the touch sensor further comprises electrically- isolated structures made of conductive material comprising a conductive mesh.

However, Hotelling does teach wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh **([0008, 0035]; The row and column traces can be formed from a transparent conductive medium such as ITO or ATO, although other transparent or non-transparent materials such as copper can also be used;** See also Gray; Fig. 2; [0063]**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claim 22, the combination of Grant, Hotelling, Gray and Frey further teach the apparatus of Claim 1, wherein the first and second conductive lines are non-linear **(Gray; [0063]**).

Regarding claim 24, the combination of Grant, Hotelling, Gray and Frey further teach the device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another **(Gray; Fig. 2; [0063]; .. this and other embodiments depict rows and columns that are inherently perpendicular to one another…)**.

Regarding claim 25, the combination of Grant, Hotelling, Gray and Frey further teach the device of Claim 11, wherein the first and second conductive lines are non-linear **(Gray; [0063])**.

11. Claims 23 and 26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant** in view of **Hotelling** in view of **Gray,** in view of **Frey** and in further view of **Chui et al. US 2008/0013144 (previously cited and hereinafter Chui)**.

Regarding claim 23, the combination of Grant, Hotelling, Gray and Frey teach the apparatus of Claim 1, but not specifically wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers **([0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less **([0105]; width between 4 and 10 microns)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling, Gray and Frey by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Regarding claim 26, the combination of Grant, Hotelling, Gray and Frey teach the device of Claim 11, but not specifically wherein the first and second conductive lines are made of fine

lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers **([0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less **([0105]; width between 4 and 10 microns**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling, Gray and Frey by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Yilmaz et al. US 2013/0032414 - Touch-sensitive apparatus e.g. tablet computer has touch sensor with drive or sense electrodes that are made of flexible conductive material so as to bend with flexible substrate at edge between surfaces.
- Yu US 2012/0299865 - Sensor for capacitive touch panel of LCD, has honeycomb patterns with hexagonal patterns that are continued to up and down/ left and right.

- Chang US 2008/0277259 - Capacitive type touch panel has column side and row side conductors that are arranged alternately on same surface of transparent substrate and are interconnected by bridging lines being separated by insulators.
- Chuang US 2011/0210935 - Sensory structure for capacitive touch panel, has mesh-typed sensory structures which are arranged along predetermined direction and electrically connected to connecting traces at two opposite sides of bridge structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Phan can be reached on (571)272-7924. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 2867

/HUY Q PHAN/
Supervisory Patent Examiner, Art Unit 2867

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Esat Yilmaz
Serial No.:	13/284,674
Filing Date:	October 28, 2011
Art Unit:	2867
Confirmation No.:	7554
Examiner:	Raul J Rios Russo
Title:	FLEXIBLE TOUCH SENSOR

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT FILED WITH REQUEST FOR CONTINUED EXAMINATION

In response to the final Office Action dated November 3, 2014, Applicants respectfully request that the Examiner reconsider the rejections of the claims in view of the following amendments and remarks. Please amend the application as follows.

In the Claims:

1. (**Currently Amended**) An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **to form a mesh grid**.

2. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. (Cancelled)

4. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. (Original) The apparatus of Claim 1, wherein the substantially flexible substrate is flat or curved.

6. (Original) The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. (Original) The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. (Cancelled)

9. (Cancelled)

10. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. (**Currently Amended**) A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **to form a mesh grid**; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. (Original) The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. (Cancelled)

14. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. (Original) The device of Claim 11, wherein the substantially flexible substrate is flat or curved.

16. (Original) The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. (Original) The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. (Cancelled)

19. (Cancelled)

20. (Original) The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

21. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another.

22. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are non-linear.

23. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

24. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another.

25. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are non-linear.

26. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

Remarks

This Application has been carefully reviewed in light of the final Office Action dated November 3, 2014 ("Final Office Action"). Applicants appreciate the Examiner's consideration of the Application. At the time of the Final Office Action, Claims 1-2, 4-7, 10-12, 14-17, and 20-26 were pending and remain rejected. Although Applicants believe all claims are allowable without amendment, to advance prosecution Applicants have made clarifying amendments to Claims 1 and 11. These amendments are not considered necessary for patentability. Additionally, these amendments are not made in response to or necessitated by any cited reference or combination of cited references. Applicants respectfully traverse the rejections and request reconsideration and allowance of all pending claims.

The Double Patenting Rejections

The Final Office Action provisionally rejects Claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646. Although Applicants do not necessarily agree, Applicants will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1-2, 7, 11-12, and 17 are otherwise allowable in their current form.

Interview Summary and Request for Subsequent Interview

On February 26, 2015, Applicants' attorneys, Brad Birchfield and colleague Bryan Parrish, conducted a telephone interview with Examiner Rios Russo and Vinh Nguyen. Applicants thank the Examiners for the courtesy and opportunity to conduct the interview and for the Examiners' thoughtful consideration of the case. Applicants submit this summary to record Applicants' attorneys' understanding of the substance of the interviews. *See* MPEP § 713.04. If Applicants' attorneys' understanding is inaccurate, notice of such would be appreciated.

During the interview, the Examiners and Applicants' attorneys discussed the rejection of Claim 1 and potential amendments to the Claims. The independent claims have been

amended according to the discussion during the interview. The examiners indicated that the amendments would overcome the current rejections.

If the Examiner intends to issue a new Office Action in response to this submission, in the interest of compact and efficient prosecution, Applicants respectfully request that the Examiner contact Applicants' attorney prior to issuing the new Office Action to discuss a possible resolution to any outstanding issues.

Section 103 Rejections

The Final Office Action rejects Claims 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("*Grant*") in view of over U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*") and further in view of U.S. Patent Application Publication No. 2010/0045614 ("*Gray*"). The Final Office Action rejects the remaining claims under 35 U.S.C. § 103(a) as being unpatentable over *Grant*, *Hotelling*, *Gray*, and other references. Applicants respectfully traverse these rejections and discuss amended independent Claim 1 below as an example.

Applicants respectfully submit that amended independent Claim 1 is allowable at least because the proposed *Grant-Hotelling-Gray* combination fails to disclose, teach, or suggest, expressly or inherently, features specifically recited in Applicants' claims. For example, the proposed *Grant-Hotelling-Gray* combination fails to disclose at least the following features recited in amended Claim 1 (emphasis added):

> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines ***that electrically contact one another at an intersection to form a mesh grid.***

The Office Action points to Figure 2 and ¶ 63 of *Gray* as allegedly teaching a previous version of the emphasized portion of Claim 1 above. (Final Office Action, pages 3 and 6.) Specifically, the Final Office Action states that although "the row and column conductors of Gray do not **directly** contact each other; they do **electrically** contact each other." (*Id.*, emphasis in original.) Whether or not those rejections and statements were appropriate (and

Applicants make no admission that they were), the cited portions of *Gray* do not disclose, teach, or suggest "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines ***that electrically contact one another at an intersection to form a mesh grid***," as recited in amended Claim 1. According to the cited portions of *Gray:*

> [0063] A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen. In some embodiments, a first portion of the conductive pattern (e.g., the columns) is disposed on a first layer, and a second portion of the conductive pattern (e.g., the rows) is disposed on a second layer; the first and second layer may be separated by a dielectric material in some embodiments. Alternatively, the row and column oriented conductors may be disposed on the same layer and may utilize known techniques for connecting elements including traces, vias, bond wires, etc. to ensure that **the first portion of conductive pattern (e.g., the columns) do not directly come into contact with the second portion of conductive pattern (e.g., the rows)**. While this and other embodiments depict rows and columns that are inherently perpendicular to one another, there may be other embodiments in which a plurality of first conductors are aligned in a first direction and a plurality of second conductors are aligned in a second direction that is different to the first direction wherein there is no particular requirements for the orientation of the first and second directions. In other words, the conductors need not necessarily be perpendicular to one another (though they may be perpendicular in one referred embodiment). Moreover, the conductors need not be oriented in vertical and horizontal axis though such orientation is shown in the described embodiments.

(*Gray*, ¶ 63, emphasis added). That is, while the cited portion of *Gray* may disclose rows and columns that do not directly come into contact with one another, they do not disclose, teach, or suggest "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines ***that electrically contact one another at an intersection to form a mesh grid***," as recited in amended Claim 1. The cited portions of *Grant* and *Hotelling* do not cure these deficiencies of *Gray*. Thus, the proposed

Grant-Hotelling-Gray combination fails to disclose, teach, or suggest each limitation of amended Claim 1.

For at least these reasons, amended independent Claim 1 and its dependent claims are allowable. For at least certain analogous reasons, amended independent Claim 11 and its dependent claims are allowable. Applicants therefore respectfully request full allowance of all pending claims.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicants respectfully request appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicants request that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicants respectfully request that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicants' arguments and amendments are made without prejudice or disclaimer. Additionally, Applicants have merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicants reserve the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicants do not acquiesce to those additional statements.

Conclusion

Applicants have made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicants respectfully request full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact Brad Birchfield, attorney for the Applicants, at 214-953-6570, at the Examiner's convenience.

As indicated on the accompanying RCE Transmittal form, the Commissioner is hereby authorized to charge the RCE fee of $1,700.00 to Deposit Account No. 02-0384 of Baker Botts L.L.P. Additionally, the Commissioner is hereby authorized to charge a one-month extension of time fee of $200.00 to Deposit Account No. 02-0384 of Baker Botts L.L.P. Although Applicants believe no other fees are due, the Commissioner is hereby authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of BAKER BOTTS L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

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2001 Ross Avenue, 6th Floor
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EXAMINER	
RIOS RUSSO, RAUL J	
ART UNIT	PAPER NUMBER
2867	

NOTIFICATION DATE	DELIVERY MODE
11/03/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 2867	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/15/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1,2,4-7,10-12,14-17 and 20-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1, 2, 4-7, 10-12, 14-17 and 20-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Response to Amendment

2. This is a response to Amendment/Req. Reconsideration-After Non-Final Rejection filed by Applicant on 10/15/2014.

3. Claims 1, 2, 4-7, 10-12, 14-17 and 20-26 are pending.

4. Claims 3, 8, 9, 13, 18 and 19 have been canceled from Applicants' previous response of 06/26/2014.

Response to Arguments

5. ***The Double Patenting Reiection:***

6. On Page 6 of the Remarks, Applicants state regarding the provisionally rejected " Claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1-2, 7, 11-12, and 17 are otherwise allowable in their current form."

Examiner still maintains the double patenting rejection of claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646.

7. ***Claim Rejections Under 35 U.S.C. 103:***

8. Applicant's arguments filed 10/15/2014 have been fully considered but they are not persuasive.

Regarding claim 1 (as well as claim 11), Applicants argue on page 8 of the Remarks that "while the cited portion of Gray may disclose row and column conductors disposed on the same layer, Gray is clear that the row and column conductors "do not directly come into contact" with each other. This is different approach from "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically, contact one another at an intersection," as recited in Claim 1 (emphasis added)."

Although Examiner does agree that the row and column conductors of Gray do not **directly** contact each other; they do **electrically** contact each other as seen on Fig. 2; paragraph [0063]:

"A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen. In some embodiments, a first portion of the conductive pattern (e.g., the columns) is disposed on a first layer, and a second portion of the conductive pattern (e.g., the rows) is disposed on a second layer; the first and second layer may be separated by a dielectric material in some embodiments. Alternatively, the row and column oriented conductors may be disposed on the same layer and may utilize known techniques for connecting elements including traces, vias, bond wires, etc. to ensure that the first portion of conductive pattern (e.g., the columns) do not directly come into contact with the second portion of conductive pattern

(e.g., the rows). While this and other embodiments depict rows and columns that are inherently perpendicular to one another, there may be other embodiments in which a plurality of first conductors are aligned in a first direction and a plurality of second conductors are aligned in a second direction that is different to the first direction wherein there is no particular requirements for the orientation of the first and second directions. In other words, the conductors need not necessarily be perpendicular to one another (though they may be perpendicular in one referred embodiment). Moreover, the conductors need not be oriented in vertical and horizontal axis though such orientation is shown in the described embodiments."

In other words, in order for Gray's touchscreen to properly function there would have to be some form of electrical contact between the row and column conductors; and the term electrical contact does not have mean direct contact between each other. Applicant is encouraged to pull everything possible from the spec that claims how the drive and sense electrodes contact each other without entering new matter.

So, for the purpose of the claim language used in claims 1 and 11, Gray does read on the argued limitation of " wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection"; thus the rejection still stands.

Claim Rejections - 35 USC § 103

9. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 2, 4-7, 10-12, 14-17, 20-22, 24 and 25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant et al. US 2008/0303782 A1 (previously cited and hereinafter Grant)** in view of **Hotelling et al. US 2008/0158183 A1 (previously cited and hereinafter Hotelling)** and in further view of **Gray et al. US 2010/0045614 (previously cited cited and hereinafter Gray**).

Regarding claim 1, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**.

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive

material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the row and column oriented conductors may be disposed on the same layer…;** See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines

(rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

Regarding claim 11, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**; as well as one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor **(Fig. 2; [0058]; Main memory 204, which may include multiple levels of cache memories, stores frequently used data and instructions. Main memory 204 may be RAM (random access memory), MRAM (magnetic RAM), or flash memory. Static memory 206 may be a ROM (read-only memory), which is coupled to bus 211, for storing static information and/or instructions).**

Grant does not specifically teach the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising a plurality of capacitive nodes **(Fig. 2a, 5 and the**

corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper) formed from drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate; See also Grant: see at least Figs. 1A, 1C, and 1E).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the**

row and column oriented conductors may be disposed on the same layer…; See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines (rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

Regarding claims 2 and 12, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does teach wherein the touch sensor **(see at least Figs. 1A-1C; [0009-0011])** further comprises tracking disposed on the substantially flexible substrate **(Figs. 3-4 and the corresponding descriptions; 302 and 310; [0060-0063])** configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3, 4 and the corresponding descriptions; 302 and 310; [0060-0063])**.

Grant does not specifically teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes.

However, Hotelling does teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections **([0005-0006, 0008]; Flex circuits can be used to connect the column (sense) and row (drive) traces on either side of the sensor panel to its associated sensor panel circuitry;** See also Gray; Fig. 2; [0063]) to or from the drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate;** See also Gray; Fig. 2; [0063])

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces. Also, the columns must be connected to analog channels so that modulated output signals can be detected.

Regarding claims 4 and 14, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate;** See also Gray; Fig. 2; [0063])**.**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 5 and 15, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the substantially flexible substrate is flat or curved **(Grant; Fig. 3; 302; flexible touch sensitive surface; the flexible touch sensitive surface is flat)**.

Regarding claims 6 and 16, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

However, Hotelling does teach wherein the touch sensor comprises:

a single-layer configuration **(Fig. 9; [0056]; single layer configuration of ITO)** with drive and sense electrodes **(see at least Figs. 1 and 2a; [0030-0033]; claim 9; sense and drive traces)** disposed only on a first surface of the substantially flexible substrate **(see at least Figs. 1 and 2a; [0030-0033]**); or

a two-layer configuration **(Figs. 3, 9; [0043, 0056];top and bottom layer of ITO for Fig. 3; and a second layer configuration of ITO can be added for Fig. 9)** with drive electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; drive traces)** disposed on the first surface of the substantially flexible substrate **(Fig. 3; [0008, 0043]; claim 9; top layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of**

the substrate) and sense electrodes (**see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces**) disposed on a second surface of the substrate opposite the first surface (**Fig. 3; [0008, 0043]; claim 9; bottom layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding the single-layer or double layer configuration as taught by Hotelling because layer configuration can be applied for the purpose of shielding, modulation and a uniform appearance.

Regarding claims 7 and 17, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor (**[0071]; some touch surfaces detect inputs by measuring capacitance change in response to a touch; See also Hotelling; see at least Figs. 1-2; 124, 126; [0030-0033, 0035]**).

Regarding claims 10 and 20, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not specifically teach wherein the touch sensor further comprises electrically- isolated structures made of conductive material comprising a conductive mesh.

However, Hotelling does teach wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh (**[0008, 0035]; The row and column traces can be formed from a transparent conductive medium such as**

ITO or ATO, although other transparent or non-transparent materials such as copper can also be used; See also Gray; Fig. 2; [0063])**.**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claim 21, the combination of Grant, Hotelling and Gray further teach the apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another **(Gray; Fig. 2; [0063]; .. this and other embodiments depict rows and columns that are inherently perpendicular to one another…).**

Regarding claim 22, the combination of Grant, Hotelling and Gray further teach the apparatus of Claim 1, wherein the first and second conductive lines are non-linear **(Gray; [0063]**).

Regarding claim 24, the combination of Grant, Hotelling and Gray further teach the device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another **(Gray; Fig. 2; [0063]; .. this and other embodiments depict rows and columns that are inherently perpendicular to one another…)**.

Regarding claim 25, the combination of Grant, Hotelling and Gray further teach the device of Claim 11, wherein the first and second conductive lines are non-linear **(Gray; [0063])**.

11. Claims 23 and 26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant** in view of **Hotelling** in view of **Gray** and in further view of **Chui et al. US 2008/0013144 (hereinafter Chui)**.

Regarding claim 23, the combination of Grant, Hotelling and Gray teach the apparatus of Claim 1, but not specifically wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers **([0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less **([0105]; width between 4 and 10 microns)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Regarding claim 26, the combination of Grant, Hotelling and Gray teach the device of Claim 11, but not specifically wherein the first and second conductive lines are made of fine

lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers **([0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less **([0105]; width between 4 and 10 microns**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Schulz et al. US 2002/0149572 - Flexible capacitive touch sensor e.g. for computer system, has resistive layer on substrate to transmit electrical signal indicating point at which user's finger contacts active touch area
- Reynolds et al. US 2009/0002339 - Touch sensor device for e.g. personal computer has touch sensor controller affixing to a flexible circuit substrate that includes pads through which the sensing elements of a sensor component couples.
- Hotelling US 2011/0005845 - Touch sensing device i.e. click wheel, for e.g. laptop computer, has conductive electrodes and conductive nodes arranged such that capacitive elements are formed between surfaces of structures to sense touch at touchable surface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Phan can be reached on (571)272-7924. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 2867

/HUY Q PHAN/
Supervisory Patent Examiner, Art Unit 2867

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Esat Yilmaz
Serial No.:	13/284,674
Filing Date:	October 28, 2011
Art Unit:	2867
Confirmation No.:	7554
Examiner:	Raul J Rios Russo
Title:	***Flexible Touch Sensor***

Commissioner for Patents
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Submission Under 37 C.F.R. § 1.111

In response to the Office Action dated July 15, 2014, Applicant respectfully requests the Examiner to reconsider the rejection of the claims in view of the comments.

Claims:

1. (Previously Presented) An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

2. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. (Cancelled)

4. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. (Original) The apparatus of Claim 1, wherein the substantially flexible substrate is flat or curved.

6. (Original) The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. (Original) The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. (Cancelled)

9. (Cancelled)

10. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. (Previously Presented) A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. (Original) The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. (Cancelled)

14. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. (Original) The device of Claim 11, wherein the substantially flexible substrate is flat or curved.

16. (Original) The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. (Original) The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. (Cancelled)

19. (Cancelled)

20. (Original) The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

21. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another.

22. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are non-linear.

23. (Previously Presented) The apparatus of Claim 1, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

24. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another.

25. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are non-linear.

26. (Previously Presented) The device of Claim 11, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

Remarks

This Application has been carefully reviewed in light of the Office Action dated July 15, 2014 (the "Office Action). Applicant believes all claims are allowable without amendment and respectfully provides the following remarks. Applicant respectfully requests reconsideration and allowance of all pending claims.

The Double Patenting Rejections

The Office Action provisionally rejects Claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579 in view of co-pending U.S. Patent Application No. 12/407,646. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1-2, 7, 11-12, and 17 are otherwise allowable in their current form.

The Claims are Allowable over the Proposed *Grant-Hotelling- Gray* Combination

The Office Action rejects Claims 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("*Grant*") in view of over U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*") and further in view of U.S. Patent Application Publication No. 2010/0045614 ("*Gray*"). Applicant respectfully traverses these rejections and discusses independent Claim 1 below as an example.

Applicant respectfully submits that independent Claim 1 is allowable at least because the proposed *Grant-Hotelling-Gray* combination fails to disclose, teach, or suggest, expressly or inherently, features specifically recited in Applicant's claims. For example, the proposed *Grant-Hotelling-Gray* combination fails to disclose at least the following features recited in Claim 1 (emphasis added):

> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***.

The Office Action admits that neither *Grant* or *Hotelling* teach the emphasized portion of Claim 1 above. (Office Action, page 7.) To attempt to cure these deficiencies of *Grant* and *Hotelling*, the Office Action points to Fig. 2 and ¶ [0063] of *Gray* as allegedly teaching this portion of Claim 1. (*Id.*) However, this is incorrect. While the cited portions of *Gray* may disclose row and column conductors disposed on the same layer, they do not disclose, teach, or suggest "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***," as recited in Claim 1. According to the cited portions of *Gray* (emphasis added):

> [0063] A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen. In some embodiments, a first portion of the conductive pattern (e.g., the columns) is disposed on a first layer, and a second portion of the conductive pattern (e.g., the rows) is disposed on a second layer; the first and second layer may be separated by a dielectric material in some embodiments. **Alternatively, the row and column oriented conductors may be disposed on the same layer and may utilize known techniques for connecting elements including traces, vias, bond wires, etc. to ensure that the first portion of conductive pattern (e.g., the columns) do not directly come into contact with the second portion of conductive pattern (e.g., the rows).** While this and other embodiments depict rows and columns that are inherently perpendicular to one another, there may be other embodiments in which a plurality of first conductors are aligned in a first direction and a plurality of second conductors are aligned in a second direction that is different to the first direction wherein there is no particular requirements for the orientation of the first and second directions. In other words, the conductors need not necessarily be perpendicular to one another (though they may be perpendicular in one referred embodiment). Moreover, the conductors need not be oriented in vertical and horizontal axis though such orientation is shown in the described embodiments.

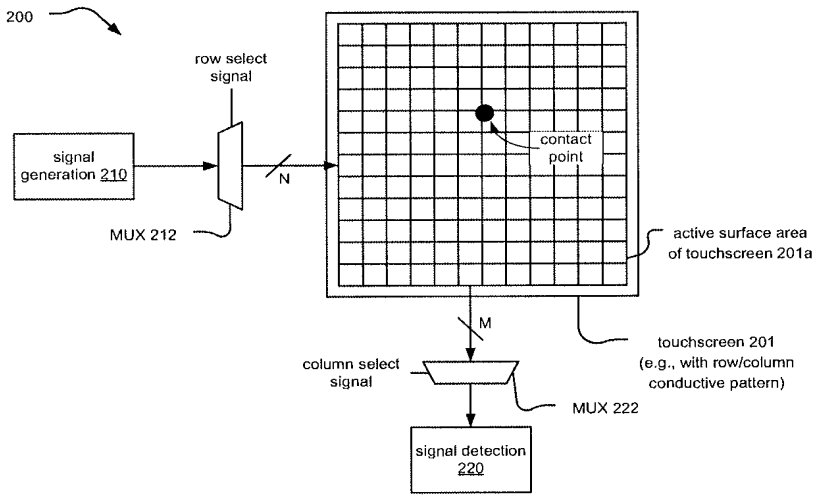

Fig. 2

(*Gray*, Fig. 2 and ¶ [0063], emphasis added.) That is, while the cited portion of *Gray* may disclose row and column conductors disposed on the same layer, *Gray* is clear that the row and column conductors "***do not directly come into contact***" with each other. This is a different approach from "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***," as recited in Claim 1 (emphasis added). Thus, the cited portions of *Gray* do not disclose, teach, or suggest each and every element of amended Claim 1. Consequently, because the Office Action admits that neither *Grant* nor *Hotelling* cure these deficiencies of *Gray*, the proposed *Grant-Hotelling-Gray* combination fails to disclose, teach, or suggest each and every element of amended Claim 1.

In addition, Applicant does not admit that the proposed combination of references is possible or that the Office Action has provided an adequate reason for combining or modifying the references in the manner proposed by the Office Action.[1] However, to avoid burdening the record and in view of the arguments presented above, Applicant does not

1 To the extent that the Office Action is attempting to include U.S. Patent No. 5,089,672 ("*Miller*") as part of the rejection of Claims 1-2, 4-7, 10-12, 14-17, 20-22, and 24-25 (Office Action, page 8), Applicant respectfully submits that all requirements of 35 U.S.C. § 103 must be met, including a sufficient explanation of why it would have been obvious to combine or modify the cited references and/or *Miller* in the manner suggested by the Office Action. Moreover, Applicant does not concede that the cited portions of *Miller* disclose what the Office Action alleges.

address this issue in this submission. Applicant reserves the right to discuss this issue in a future submission, if appropriate.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 1 and its dependent claims. For at least certain analogous reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 11 and its dependent claims.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicant does not acquiesce to those additional statements.

Conclusion

Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact the Attorney for Applicant at the Examiner's convenience.

Applicant believes no fee to be currently due, however, the Commissioner is hereby authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of BAKER BOTTS L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
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13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

12323 7590 07/15/2014

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EXAMINER	
RIOS RUSSO, RAUL J	
ART UNIT	PAPER NUMBER
2867	

NOTIFICATION DATE	DELIVERY MODE
07/15/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 2867	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06/26/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1,2,4-7,10-12,14-17 and 20-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,2,4-7,10-12,14-17 and 20-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/26/2014 has been entered.

Response to Amendment

3. This is a response to Amendment/Req. Reconsideration-After Final Rejection filed by Applicant on 06/26/2014.

4. Claims 1, 2, 4-7, 10-12, 14-17 and 20 are pending.

5. Claims 1, 4, 11 and 14 have been amended.

6. Claims 3, 8, 9, 13, 18 and 19 have been canceled.

7. Claims 21-26 have been added.

Response to Arguments

8. ***Claim Rejections Under 35 U.S.C. 103:***

9. Applicant's arguments, see pages 7-10, filed on 06/26/2014, with respect to the rejection(s) of claim(s) 1-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("Grant") in view of over U.S. Patent Application Publication No. 2008/0158183 ("Hotelling") have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new

ground(s) of rejection is made in view of Gray et al. (US 2010/0045614) in combination with the previously stated prior arts.

Double Patenting

10. Applicant states that although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1, 2, 7, 11, 12, and 17 are otherwise allowable in their current form.

Based on the amendments presented by the Applicant, Examiner acknowledges and withdraws the non-statutory non-obvious type double patenting rejection. However, a non-statutory obviousness type (with a secondary reference) double patenting rejection is presented instead; thus maintaining the double patenting rejection.

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

12. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

13. The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1, 2, 7, 11, 12 and 17 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 3, 12, 15, 17 and 26 of U.S. Patent No. 13/198,579 (US 2013/0032414 A1) in view of U.S. Patent No. 12/407,646 (US 2010/0045614). Primary reference fails to disclose "wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection." (Applicant's amendment on claims 1 and 11). However, U.S. Patent No. 12/407,646 does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify U.S. Patent No. 13/198,579 by including the conductive lines (rows and columns) taught by U.S. Patent No. 12/407,646 (Gray et al.) for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

Although the claims at issue are not identical, they are not patentably distinct from each other because

The limitations of claim 1 are disclosed in claim 1 of the copending Application No. 13/198,579; except for the amended limitation "wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection" which is disclosed in U.S. Patent No. 12/407,646 **(Fig. 2; [0063]).**

The limitations of claim 2 are disclosed in claim 3 of the copending Application No. 13/198,579.

The limitations of claim 7 are disclosed in claim 12 of the copending Application No. 13/198,579.

The limitations of claim 11 are disclosed in claim 15 of the copending Application No. 13/198,579; except for the amended limitation "wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection" which is disclosed in U.S. Patent No. 12/407,646 **(Fig. 2; [0063]).**

The limitations of claim 12 are disclosed in claim 17 of the copending Application No. 13/198,579.

The limitations of claim 17 are disclosed in claim 26 of the copending Application No. 13/198,579.

Claim Rejections - 35 USC § 103

14. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. Claims 1, 2, 4-7, 10-12, 14-17, 20-22, 24 and 25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant et al. US 2008/0303782 A1 (previously cited and hereinafter Grant)** in view of **Hotelling et al. US 2008/0158183 A1 (previously cited and hereinafter Hotelling)** and in further view of **Gray et al. US 2010/0045614 (Newly cited and hereinafter Gray**).

Regarding claim 1, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**.

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the**

row and column oriented conductors may be disposed on the same layer…; See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines (rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

Regarding claim 11, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**; as well as one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor **(Fig. 2; [0058]; Main memory 204, which may include multiple levels of cache memories, stores frequently used data and instructions. Main memory 204 may be RAM (random access memory), MRAM (magnetic RAM), or flash memory. Static memory 206 may be a ROM (read-only memory), which is coupled to bus 211, for storing static information and/or instructions).**

Grant does not specifically teach the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising a plurality of capacitive nodes **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** formed from drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate; See also Grant: see at least Figs. 1A, 1C, and 1E).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Neither Grant nor Hotelling specifically teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection.

However, Gray does teach wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection **(Fig. 2; [0063]; A number of conductors forming rows and columns of a conductive pattern (e.g., indium tin oxide (ITO)) may be deposited on a substrate composed of polyester or other material on one or more layers of the touchscreen… the row and column oriented conductors may be disposed on the same layer…;** See also Miller US 5,089,672; Col. 2, lines 11-16; Col. 5, lines 1-20; Col. 5, lines 61-68**).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant and Hotelling by including the conductive lines (rows and columns) taught by Gray for the purpose of "providing paths for signals traveling through the touchscreen" (See Gray; Abstract).

Regarding claims 2 and 12, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does teach wherein the touch sensor **(see at least Figs. 1A-1C; [0009-0011])** further comprises tracking disposed on the substantially flexible substrate **(Figs. 3-4 and the corresponding descriptions; 302 and 310; [0060-0063])** configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3, 4 and the corresponding descriptions; 302 and 310; [0060-0063])**.

Grant does not specifically teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes.

However, Hotelling does teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections **([0005-0006, 0008]; Flex circuits can be used**

to connect the column (sense) and row (drive) traces on either side of the sensor panel to its associated sensor panel circuitry; See also Gray; Fig. 2; [0063]) to or from the drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate;** See also Gray; Fig. 2; [0063])

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces. Also, the columns must be connected to analog channels so that modulated output signals can be detected.

Regarding claims 4 and 14, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate;** See also Gray; Fig. 2; [0063])**.**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 5 and 15, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the substantially flexible substrate is flat or curved **(Grant; Fig. 3; 302; flexible touch sensitive surface; the flexible touch sensitive surface is flat)**.

Regarding claims 6 and 16, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not teach wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

However, Hotelling does teach wherein the touch sensor comprises:

a single-layer configuration **(Fig. 9; [0056]; single layer configuration of ITO)** with drive and sense electrodes **(see at least Figs. 1 and 2a; [0030-0033]; claim 9; sense and drive traces)**

disposed only on a first surface of the substantially flexible substrate **(see at least Figs. 1 and 2a; [0030-0033]**); or

a two-layer configuration **(Figs. 3, 9; [0043, 0056];top and bottom layer of ITO for Fig. 3; and a second layer configuration of ITO can be added for Fig. 9**) with drive electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; drive traces**) disposed on the first surface of the substantially flexible substrate **(Fig. 3; [0008, 0043]; claim 9; top layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate**) and sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces)** disposed on a second surface of the substrate opposite the first surface **(Fig. 3; [0008, 0043]; claim 9; bottom layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding the single-layer or double layer configuration as taught by Hotelling because layer configuration can be applied for the purpose of shielding, modulation and a uniform appearance.

Regarding claims 7 and 17, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant further teaches wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor **([0071]; some touch surfaces detect inputs by measuring capacitance change in response to a touch; See also Hotelling; see at least Figs. 1-2; 124, 126; [0030-0033, 0035]).**

Regarding claims 10 and 20, the combination of Grant, Hotelling and Gray teach the apparatus of Claims 1 and 11; where Grant does not specifically teach wherein the touch sensor further comprises electrically- isolated structures made of conductive material comprising a conductive mesh.

However, Hotelling does teach wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh **([0008, 0035]; The row and column traces can be formed from a transparent conductive medium such as ITO or ATO, although other transparent or non-transparent materials such as copper can also be used;** See also Gray; Fig. 2; [0063])**.**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claim 21, the combination of Grant, Hotelling and Gray further teach the apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another **(Gray; Fig. 2; [0063]; .. this and other embodiments depict rows and columns that are inherently perpendicular to one another…).**

Regarding claim 22, the combination of Grant, Hotelling and Gray further teach the apparatus of Claim 1, wherein the first and second conductive lines are non-linear **(Gray; [0063])**.

Regarding claim 24, the combination of Grant, Hotelling and Gray further teach the device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another **(Gray; Fig. 2; [0063]; .. this and other embodiments depict rows and columns that are inherently perpendicular to one another…)**.

Regarding claim 25, the combination of Grant, Hotelling and Gray further teach the device of Claim 11, wherein the first and second conductive lines are non-linear **(Gray; [0063])**.

16. Claims 23 and 26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant** in view of **Hotelling** in view of **Gray** and in further view of **Chui et al. US 2008/0013144 (Newly cited and hereinafter Chui)**.

Regarding claim 23, the combination of Grant, Hotelling and Gray teach the apparatus of Claim 1, but not specifically wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers **([0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less **([0105]; width between 4 and 10 microns)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Regarding claim 26, the combination of Grant, Hotelling and Gray teach the device of Claim 11, but not specifically wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

However, Chui does teach wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers (**[0104]; thickness between 0.1 – 0.2 microns;** See also Rothkopf et al. US 2012/0242592; [0035]; 10 microns) or less and a width of approximately 10 micrometers or less (**[0105]; width between 4 and 10 microns**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Grant, Hotelling and Gray by implementing the conducting lines with the dimensions taught by Chui in order to achieve the purpose of touch sensing functionality.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Miller US 5,089,672 - Flexible conductive contact for force actuated switch includes first group of fibres with one portion constructed of electrically non-conductive material and other portion of conductive material.
- Tatelbaum et al. US 2012/0098785 - Garment e.g. glove for electronic device e.g. personal digital assistant, has conductive element located on exterior surface of shell, which conducts signal recognizable by touch-sensitive device.
- Chang US 2008/0277259 - Capacitive type touch panel has column side and row side conductors that are arranged alternately on same surface of transparent substrate and are interconnected by bridging lines being separated by insulators.
- Rothkopf et al. US 2012/0242592 - Electronic device, has internal component covered with portion of active display region, flexible display deformed by action external to device, where deformation of flexible display creates response from internal component.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Phan can be reached on (571)272-7924. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 2867

/HUY Q PHAN/
Supervisory Patent Examiner, Art Unit 2867

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Esat Yilmaz
Serial No.:	13/284,674
Filing Date:	October 28, 2011
Art Unit:	2867
Confirmation No.:	7554
Examiner:	Raul J Rios Russo
Title:	***Flexible Touch Sensor***

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P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE ACCOMPANYING REQUEST FOR CONTINUED EXAMINATION

In response to the Final Office Action dated February 26, 2014, Applicant respectfully requests the Examiner to reconsider the rejections of the claims in view of the amendments and comments set forth below. Please amend the application as follows.

In the Claims:

1. **(Currently Amended)** An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate**, wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection**.

2. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. **(Cancelled)**

4. **(Currently Amended)** The apparatus of Claim ~~3~~**1**, wherein the **first and second conductive lines are**~~conductive mesh is~~ made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. (Original) The apparatus of Claim 1, wherein the substantially flexible substrate is flat or curved.

6. (Original) The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. (Original) The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. **(Cancelled)**

9. **(Cancelled)**

10. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. **(Currently Amended)** A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, **wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection**; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. (Original) The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. **(Cancelled)**

14. **(Currently Amended)** The device of Claim ~~13~~**11**, wherein the **first and second conductive lines are**~~conductive mesh is~~ made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. (Original) The device of Claim 11, wherein the substantially flexible substrate is flat or curved.

16. (Original) The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. (Original) The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. **(Cancelled)**

19. **(Cancelled)**

20. (Original) The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

21. **(New)** The apparatus of Claim 1, wherein the first and second conductive lines are substantially orthogonal to one another.

22. **(New)** The apparatus of Claim 1, wherein the first and second conductive lines are non-linear.

23. **(New)** The apparatus of Claim 1, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

24. **(New)** The device of Claim 11, wherein the first and second conductive lines are substantially orthogonal to one another.

25. **(New)** The device of Claim 11, wherein the first and second conductive lines are non-linear.

26. **(New)** The device of Claim 11, wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less.

Remarks

This Application has been carefully reviewed in light of the final Office Action dated February 26, 2014 ("Final Office Action). Applicant appreciates the Examiner's consideration of the Application. Although Applicant believes all claims are allowable without amendment, Applicant has made clarifying amendments to Claims 1, 4, 11, and 14 in order to advance prosecution. At least certain of these amendments are not considered narrowing, and none are considered necessary for patentability. Applicant has also added new Claims 21-26 and canceled Claims 3, 8-9, 13, and 18-19 without prejudice or disclaimer. None of these amendments are believed to add any new matter. Applicant respectfully requests reconsideration and allowance of all pending claims and consideration and allowance of all new claims.

Request for Subsequent Interview

If, in response to Applicant's present submission, the Examiner intends to issue a new Office Action rejecting some or all of the pending claims, in the interest of compact and efficient prosecution Applicant respectfully requests that the Examiner contact Applicant's attorney prior to issuing the new Office Action to discuss a possible resolution to any outstanding issues.

Statement of Substance of Interview

Applicant, through its attorney Brad Birchfield, interviewed Examiner Rios Russo on June 24, 2014 ("Examiner Interview"). Applicant appreciates the Examiner's courtesy and professionalism during the Examiner Interview. During the Examiner Interview, the participants generally discussed the application and potential amendments to the claims. The independent claims have been amended consistent with the discussion in the Examiner Interview. The Examiner agreed that these amendments would overcome the current rejections.

The Double Patenting Rejections

The Final Office Action provisionally rejects Claims 1-2, 7, 11-12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over

Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1, 2, 7, 11, 12, and 17 are otherwise allowable in their current form.

The Claims are Allowable over the Proposed *Grant-Hotelling* combination

The Final Office Action rejects Claims 1-20 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("*Grant*") in view of over U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*"). Applicant respectfully traverses these rejections and discusses amended independent Claim 1 below as an example.

Applicant respectfully submits that amended independent Claim 1 is allowable at least because the proposed *Grant-Hotelling* combination fails to disclose, teach, or suggest, expressly or inherently, features specifically recited in Applicant's claims. For example, the proposed *Grant-Hotelling* combination fails to disclose at least the following features recited in amended Claim 1 (emphasis added):

> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***.

The Final Office Action points to ¶ [0008] of *Hotelling* as allegedly teaching a previous version of this portion of Claim 1. (Final Office Action, page 8.) Whether or not those rejections were appropriate (and Applicant makes no admission that they were), the cited portions of *Hotelling* do not disclose, teach, or suggest "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***," as recited in amended Claim 1. According to the cited portions of *Hotelling*:

> [0008] A multi-touch sensor panel can be created using a substrate with column and row traces formed on either side of the substrate using a novel fabrication process. Flex circuits can be used to connect the column and row

> traces on either side of the sensor panel to its associated sensor panel circuitry. Traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel. A single flex circuit can be fabricated to connect to the rows and columns on directly opposing sides at the same edge of the substrate. Furthermore, the row traces can be widened to shield the column traces from a modulated Vcom layer.

(*Hotelling*, ¶ [0008], emphasis added.) That is, while the cited portion of *Hotelling* may disclose row and column traces, it does not disclose, teach, or suggest "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***," as recited in amended Claim 1. Furthermore, other portions of *Hotelling* disclose that row and column traces of *Hotelling* do not make electrical contact with each other:

> [0035] As mentioned above, multi-touch panel 124 can in some embodiments include a capacitive sensing medium having **a plurality of row traces or driving lines and a plurality of column traces or sensing lines (although other sensing media may also be used) separated by a dielectric**. ...
>
> [0036] **At the "intersections" of the traces, where the traces pass above and below each other (but do not make direct electrical contact with each other), the traces essentially form two electrodes (although more than two traces could intersect as well)**. Each intersection of row and column traces can represent a capacitive sensing node and can be viewed as picture element (pixel) 126, which can be particularly useful when multi-touch panel 124 is viewed as capturing an "image" of touch. ...

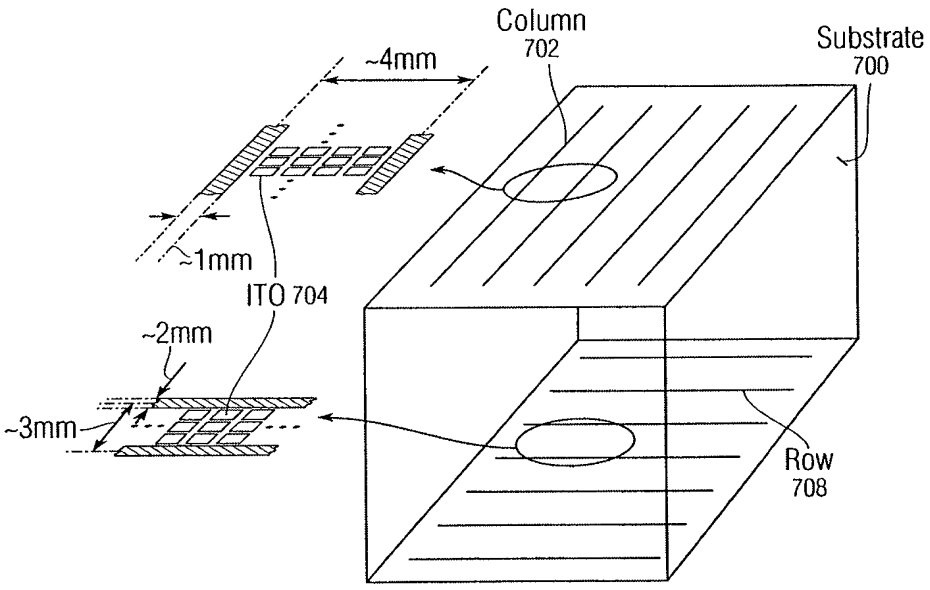

Fig. 7

(*Hotelling*, ¶¶ [0035]-[0036] and figure 7, emphasis added.) That is, *Hotelling* discloses row and column traces on two different sides of a dielectric that "do not make direct electrical contact with each other," a different approach from "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, ***wherein the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection***," as recited in amended Claim 1. The cited portions of *Grant* do not appear to cure these deficiencies of *Hotelling*, and the Final Office Action does not appear to allege that they do. Consequently, the proposed *Grant-Hotelling* combination fails to disclose, teach, or suggest each and every element of amended Claim 1.

For at least these reasons, amended independent Claim 1 and its dependent claims are allowable. For at least certain analogous reasons, amended independent Claim 11 and its dependent claims are also allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of all pending claims.

In addition, Applicant respectfully notes that a reference "must be considered in its entirety, i.e. as a whole, including portions that would lead away from the claimed

invention." MPEP § 2141.02(VI); *see also KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1739 (2007) (when the cited reference teaches away from combining certain elements, discovery of a successful means of combining them is more likely to be nonobvious). Here, *Hotelling* teaches away from the claimed feature of amended Claim 1 of "***first and second conductive lines that electrically contact one another at an intersection***" because as discussed above, it discloses row and column traces that are on two different sides of a dielectric and "do not make direct electrical contact with each other." Thus, because *Hotelling* teaches away from recited features of amended Claim 1, the proposed combination of *Hotelling* and *Grant* is improper and does not render Claim 1 obvious. Accordingly, Applicant respectfully requests reconsideration and allowance of amended Claim 1 and its dependent claims.

For at least these additional reasons, amended independent Claim 1 and its dependent claims are allowable. For at least certain analogous reasons, amended independent Claim 11 and its dependent claims are also allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of all pending claims.

Support for Claim Amendments

Applicant hereby provides support for the amendments to the independent claims. Support for these amendments may be found throughout the application and at least in figures 2A and 3 and in ¶ [0020] of the published specification.

New Dependent Claims 21-26 are Allowable

New Claims 21-26 depend from independent Claims 1 and 11, which Applicant has shown above to be allowable over the proposed *Grant-Hotelling* combination. Accordingly, new dependent Claims 21-26 are allowable over the proposed *Grant-Hotelling* combination at least because they depend on allowable independent claims. Additionally, dependent Claims 21-26 recite further patentable distinctions over the proposed *Grant-Hotelling* combination. To avoid burdening the record and in view of the clear allowability of independent Claims 1 and 11, Applicant does not discuss these distinctions in this Response. However, Applicant reserves the right to discuss these distinctions in a future Response or on Appeal, if appropriate. For at least these reasons, new dependent Claims 21-26 are allowable.

Accordingly, Applicant respectfully requests reconsideration and allowance of all pending claims.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicant does not acquiesce to those additional statements.

Conclusion

Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact the Attorney for Applicant at the Examiner's convenience.

As indicated on the accompanying RCE Transmittal form, the Commissioner is hereby authorized to charge the RCE fee of $1200.00 to Deposit Account No. 02-0384 of Baker Botts L.L.P. Additionally, the Commissioner is hereby authorized to charge the one-month extension fee of $200.00 to Deposit Account No. 02-0384 of Baker Botts L.L.P. Although Applicant believes no other fees are due, the Commissioner is hereby authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of BAKER BOTTS L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

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12323 7590 02/26/2014

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2001 Ross Avenue, 6th Floor
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EXAMINER	
RIOS RUSSO, RAUL J	
ART UNIT	**PAPER NUMBER**
2867	

NOTIFICATION DATE	DELIVERY MODE
02/26/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 2867	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/07/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Response to Amendment

2. This is a response to Amendment/Req. Reconsideration-After Non-Final Rejection filed by Applicant on 02/07/2014.

3. Claims 1-20 are pending.

4. Claim 11 has been amended.

Response to Arguments

Double Patenting Rejection:

On page 5 of the remarks, regarding the provisionally rejects Claims 1, 2, 7, 11, 12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579, Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1, 2, 7, 11, 12, and 17 are otherwise allowable in their current form.

Examiner still maintains the double patenting rejection as the Claims 1, 2, 7, 11, 12, and 17 still read over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579.

Also, though claims 3-6, 8-10, 13-16 and 18-20 are not specifically addressed, they are also rejected on the ground of non-statutory double patenting as the claims above.

Claim Reiections Under 35 U.S.C. 103:

5. Applicant's arguments filed 02/07/2014 have been fully considered but they are not persuasive.

With regards to claim 1, on pages 6 and 7 of the remarks, Applicant argues that the combination of Grant and Hotelling do not "disclose, teach, or suggest a touch sensor that comprises "drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in Claim 1"; nor disclosing "a substantially flexible substrate; a touch sensor disposed on the substantially flexible substrate ....configured to bend with the substantially flexible substrate." (See page 6). Examiner respectfully disagrees with Applicant's position as follows.

Grant clearly teaches "a touch sensor…configured to bend with the substantially flexible substrate (Grant; see at least Figs. 1A, 1C, and 1E)." Therefore, Grant teaches "a touch sensor…configured to bend with the substantially flexible substrate." Grant clearly teaches "the touch sensor is made of flexible conductive material configured to bend with the substantially flexible substrate (Grant; paragraphs [0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input; Hotelling: Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)."

Grant specifically discloses that the electronic interactive device includes a flexible touch sensitive surface, a flexible screen (or display), and an actuator. The flexible touch sensitive surface is deposited over the flexible screen and is capable of receiving an input, such as, for example, from a user (Grant; see at least Abstract).

Therefore, Grant teaches "a flexible touch sensitive surface" that "is deposited over the flexible screen."

The combination of Grant and Hotelling does teach touch sensor (Hotelling; Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor) comprising drive or sense electrodes each drive or sense electrode (Hotelling; Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper) made of flexible (Grant; see at least Figs. 1A, 1C, and 1E) conductive material (Grant: see at least Figs. 1A, 1C, and 1E; see also Hotelling: i.e., metal traces) configured to bend with the substantially flexible substrate (Grant: see at least Figs. 1A, 1C, and 1E). Therefore, the combination teaches all of the limitations of claim and the rejection stands.

Regarding claim 11, Applicant makes the same arguments as done for claim 1 (See page 8). Examiner respectfully disagrees with Applicant's position for the reasons stated before. Additionally, Applicant argues that the combination of Grant and Hotelling does not "disclose, teach, or suggest "capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in amended independent Claim 1." (See page 8). Examiner respectfully disagrees with Applicant's position as follows.

The combination of Grant and Hotelling does teach touch sensor (Hotelling; Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor) comprising a plurality of capacitive nodes (Hotelling; Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and

column traces made of copper) formed from drive or sense electrodes each drive or sense electrode (Hotelling; Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper) made of flexible (Grant: see at least Figs. 1A, 1C, and 1E) conductive material (Grant: see at least Figs. 1A, 1C, and 1E; see also Hotelling: i.e., metal traces) configured to bend with the substantially flexible substrate (Grant: see at least Figs. 1A, 1C, and 1E). Therefore, the combination teaches all of the limitations of the amended claim 11 and the rejection stands.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with

this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

7. Claims 1, 2, 7, 11, 12 and 17 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 3, 12, 15, 17 and 26 of copending Application No. 13/198,579 (US 2013/0032414 A1). Although the claims at issue are not identical, they are not patentably distinct from each other because

The limitations of claim 1 are disclosed in claim 1 of the copending Application No. 13/198,579.

The limitations of claim 2 are disclosed in claim 3 of the copending Application No. 13/198,579.

The limitations of claim 7 are disclosed in claim 12 of the copending Application No. 13/198,579.

The limitations of claim 11 are disclosed in claim 15 of the copending Application No. 13/198,579.

The limitations of claim 12 are disclosed in claim 17 of the copending Application No. 13/198,579.

The limitations of claim 17 are disclosed in claim 26 of the copending Application No. 13/198,579.

Also, though claims 3-6, 8-10, 13-16 and 18-20 are not specifically addressed, they are also rejected on the ground of non-statutory double patenting as the claims above.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claim Rejections - 35 USC § 103

8. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-20 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant et al. US 2008/0303782 A1 (previously cited and hereinafter Grant)** in view of **Hotelling et al. US 2008/0158183 A1 (previously cited and hereinafter Hotelling)**.

Regarding claim 1, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user**

input) disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**.

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Regarding claim 11, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor **([0003], [0005], [0006], [0022], [0023], [0027], and [0071], e.g., flexible surface, flexible circuitry, and capacitance touch sensor which must be conductive to receive user input)** disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**; as well as one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor **(Fig. 2; [0058]; Main memory 204, which may include multiple levels of cache memories, stores frequently used data and instructions. Main memory 204 may be RAM (random access memory), MRAM (magnetic RAM), or flash memory. Static memory 206 may be a ROM (read-only memory), which is coupled to bus 211, for storing static information and/or instructions).**

Grant does not specifically teach the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** comprising a plurality of capacitive nodes **(Fig. 2a, 5 and the corresponding descriptions, and the Summary of the Invention, i.e., a touch sensor comprises of row and column traces made of copper)** formed from drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of

flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate; See also Grant: see at least Figs. 1A, 1C, and 1E).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Regarding claims 2 and 12, the apparatus of Claims 1 and 11, Grant does teach wherein the touch sensor **(see at least Figs. 1A-1C; [0009-0011])** further comprises tracking disposed on the substantially flexible substrate **(Figs. 3-4 and the corresponding descriptions; 302 and 310; [0060-0063])** configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3, 4 and the corresponding descriptions; 302 and 310; [0060-0063])**.

Grant does not specifically teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes.

However, Hotelling does teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections **([0005-0006, 0008]; Flex circuits can be used to connect the column (sense) and row (drive) traces on either side of the sensor panel to its associated sensor panel circuitry)** to or from the drive or sense electrodes **(see at least Figs. 1**

and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces. Also, the columns must be connected to analog channels so that modulated output signals can be detected.

Regarding claims 3 and 13, Grant does not teach wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

However Hotelling does teach, the apparatus of Claims 2 and 12 wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be

bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 4 and 14, the apparatus of Claims 3 and 13, Grant does not teach wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 5 and 15, the apparatus of Claims 1 and 11, Grant further teaches wherein the substantially flexible substrate is flat or curved **(Grant; Fig. 3; 302; flexible touch sensitive surface; the flexible touch sensitive surface is flat)**.

Regarding claims 6 and 16, the apparatus of Claims 1 and 11, Grant does not teach wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

However, Hotelling does teach wherein the touch sensor comprises:

a single-layer configuration **(Fig. 9; [0056]; single layer configuration of ITO)** with drive and sense electrodes **(see at least Figs. 1 and 2a; [0030-0033]; claim 9; sense and drive traces)** disposed only on a first surface of the substantially flexible substrate **(see at least Figs. 1 and 2a; [0030-0033])**; or

a two-layer configuration **(Figs. 3, 9; [0043, 0056];top and bottom layer of ITO for Fig. 3; and a second layer configuration of ITO can be added for Fig. 9)** with drive electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; drive traces)** disposed on the first surface of the substantially flexible substrate **(Fig. 3; [0008, 0043]; claim 9; top layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** and sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces)** disposed on a second surface of the substrate opposite the first surface **(Fig. 3; [0008, 0043]; claim 9; bottom layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding the single-layer or double layer configuration as taught by Hotelling because layer configuration can be applied for the purpose of shielding, modulation and a uniform appearance.

Regarding claims 7 and 17, the apparatus of Claims 1 and 11, Grant further teaches wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor **([0071]; some touch surfaces detect inputs by measuring capacitance change in response to a touch; See also Hotelling; see at least Figs. 1-2; 124, 126; [0030-0033, 0035]).**

Regarding claims 8 and 18, the apparatus of Claims 1 and 11, Grant does not specifically teach wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

However, Hotelling does teach wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes **([0008, 0035]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate; traces made of copper or other highly conductive metals running along the edge of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the

row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 9 and 19, the apparatus of Claims 1 and 11, Grant does not specifically wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate; traces made of copper or other highly conductive metals running along the edge of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 10 and 20, the apparatus of Claims 1 and 11, Grant does not specifically teach wherein the touch sensor further comprises electrically- isolated structures made of conductive material comprising a conductive mesh.

However, Hotelling does teach wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh **([0008, 0035]; The row and column traces can be formed from a transparent conductive medium such as ITO or ATO, although other transparent or non-transparent materials such as copper can also be used).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Hotelling et al. US 7,663,607 - Touch panel for e.g. tablet personal computer, has transparent capacitive sensing medium that detects touches or near touches occurring at same time and at distinct locations in plane to produce distinct signals.
- Hotelling et al. US 2008/0165139 - Multi-touch sensor panel forming method for e.g. mobile telephone, involves orienting traces to cross over each other at crossover locations separated by fluid, where locations form capacitance sensors for detecting touches.
- Choi US 2012/0038613 - Flexible display apparatus e.g. mobile phone has control unit that controls power supply unit to stop supply of operating power to flexible display unit based on detected bending of flexible display unit. Choi discloses **a touch sensor** (Choi: Fig. 3, i.e., 20) **disposed on the substantially flexible substrate** (Choi: Fig. 3, i.e., 10) **and configured to bend with the substantially flexible substrate at the edge between the first and second surfaces. Choi**

further discloses the touch sensor comprising drive or sense electrodes made of flexible conductive material (Choi: paragraphs [0067] – [0068], 20 is flexible as illustrated in Fig. 3 and 20 must be made of conductive material in order to detects such a capacitance change and a voltage change).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Phan can be reached on (571)272-7924. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 2867

/HUY Q PHAN/
Supervisory Patent Examiner, Art Unit 2867

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Esat Yilmaz
Serial No.:	13/284,674
Filing Date:	October 28, 2011
Art Unit:	2867
Confirmation No.:	7554
Examiner:	Raul J Rios Russo
Title:	***Flexible Touch Sensor***

Response Under 37 C.F.R. § 1.111

In response to the Non-Final Office Action dated November 7, 2013, Applicant respectfully requests the Examiner to reconsider the rejections of the claims in view of the following amendments and remarks. Please amend the Application as follows.

In the Claims:

1. (Original) An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate.

2. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. (Original) The apparatus of Claim 2, wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

4. (Original) The apparatus of Claim 3, wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. (Original) The apparatus of Claim 1, wherein the substantially flexible substrate is flat or curved.

6. (Original) The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. (Original) The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. (Original) The apparatus of Claim 1, wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

9. (Original) The apparatus of Claim 8, wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

10. (Original) The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. (Currently Amended) A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. (Original) The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. (Original) The device of Claim 12, wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

14. (Original) The device of Claim 13, wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. (Original) The device of Claim 11, wherein the substantially flexible substrate is flat or curved.

16. (Original) The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. (Original) The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. (Original) The device of Claim 11, wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

19. (Original) The device of Claim 18, wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

20. (Original) The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

Remarks

This Application has been reviewed carefully in light of the Non-Final Office Action dated November 7, 2013. Applicant appreciates the Examiner's consideration of the Application. Although Applicant believes all claims are allowable without amendment, to advance prosecution Applicant has made clarifying amendments to Claim 11. These amendments are not considered necessary for patentability. Additionally, Applicant does not admit that these amendments are made in response to or necessitated by any cited reference or combination of cited references. Applicant respectfully requests reconsideration and allowance of all pending claims.

The Double Patenting Rejections

The Office Action provisionally rejects Claims 1, 2, 7, 11, 12, and 17 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 3, 12, 15, 17, and 26 of co-pending U.S. Patent Application No. 13/198,579. Although Applicant does not necessarily agree, Applicant will consider filing a terminal disclaimer to obviate this rejection if the Examiner indicates that Claims 1, 2, 7, 11, 12, and 17 are otherwise allowable in their current form.

The Claims are Allowable over the Proposed *Grant-Hotelling* Combination

The Office Action rejects Claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2008/0303782 ("*Grant*") in view of over U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*"). Applicant respectfully traverses these rejections and discusses independent Claims 1 and 11 as examples.

Independent Claim 1 recites the following:

> An apparatus comprising:
> a substantially flexible substrate; and
> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate.

Applicant respectfully submits that the proposed *Grant-Hotelling* combination fails to disclose, teach, or suggest various limitations recited in independent Claim 1.

For example, at a minimum, *Hotelling* does not appear to disclose, teach, or suggest a touch sensor that comprises "drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in Claim 1. At best, the cited portions of *Hotelling* appear to disclose metal traces made of copper running along the edge of the substrate that can be used to bring indium tin oxide (ITO) row traces to the same edge of the substrate as ITO column traces. *See Hotelling* in Fig. 5, elements 510, 508, and 502, and at ¶¶ 8 and 46. Even assuming for the sake of argument only that the row and column ITO traces in *Hotelling* could be equated to the claimed drive or sense electrodes (which the Office Action asserts, but Applicant does not concede), the cited portions of *Hotelling* still would not disclose, teach, or suggest "drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in amended independent Claim 1. Instead, *Hotelling* discloses a sensor panel with row and column traces formed from ITO with separate metal traces connecting row traces to an edge of a substrate. Furthermore, *Hotelling* is silent regarding metal or ITO traces being configured to bend with a flexible substrate.

The cited portions of *Grant* do not appear to make up for at least the above-discussed deficiencies of *Hotelling*. The Office Action appears to rely primarily on *Grant* as allegedly disclosing "a substantially flexible substrate; a touch sensor disposed on the substantially flexible substrate,. . . configured to bend with the substantially flexible substrate." *Office Action* at p. 4 (citing *Grant* in Figures 1A-1C and 3 and at Abstract and ¶3). *Grant* is generally directed to "[a] method and apparatus for an electronic interactive device having a haptic enabled flexible touch sensitive surface." See *Grant* at Abstract.

Although *Grant* purports to disclose "a flexible touch sensitive surface" that "is deposited over the flexible screen," *Grant* fails to support such a proposition. *See Grant* at Abstract. Instead, *Grant* contains only conclusory statements regarding a flexible touch screen surface, with no substantive disclosure as to the nature of the supposed flexible touch sensitive surface. For instance, *Grant* notes that "[a] conventional touch-sensitive component of a touch panel employs various types of touch sensing technology such as capacitive sensors, pressure sensors and the like as known in the art to detect locations being pressed on the panel." See *Grant* at ¶3. Although *Grant* mentions that "the flexible touch sensitive

surface is deposited over the rollable display," *Grant* provides no substantive description of the supposed flexible touch sensitive surface. *See Grant* at ¶28. Instead, *Grant* merely indicates that "[i]n the interest of clarity, not all of the standard hardware and routine features of the implementations described herein are shown and described." See *Grant* at ¶21.

At a minimum, in view of *Grant*'s lack of actual disclosure regarding the purported "flexible touch sensitive surface," Applicants respectfully submit that *Grant* fails to disclose, teach, or suggest "a touch sensor . . . configured to bend with the substantially flexible substrate," as recited in amended Claim 1.

Therefore, at a minimum, the cited portions of the proposed *Grant-Hotelling* combination, whether considered alone or in combination, do not disclose, teach, or suggest a touch sensor that comprises "drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in Claim 1.

Moreover, Applicant does not admit that the proposed *Grant-Hotelling* combination is possible or that the Office Action provides an adequate reason, either from the cited references or from knowledge generally available to one of ordinary skill in the art at the time of Applicant's invention, to combine or modify the cited references in the proposed manner. Although due to at least the above-discussed deficiencies Applicant does not discuss this issue in detail in this submission, Applicant reserves the right to discuss this issue in a future submission if appropriate.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 1 and its dependent claims.

Additionally, the proposed *Grant-Hotelling* combination fails to disclose, teach, or suggest various limitations recited in independent Claim 11.

Independent Claim 11 recites the following:

> A device comprising:
> a substantially flexible substrate;
> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising a plurality of capacitive nodes formed from drive

> or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate; and
>
> one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

As a first example, as discussed above with reference to Claim 1, the proposed Grant-*Hotelling* combination does not disclose, teach, or suggest a touch sensor that comprises "drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in Claim 11 even prior to the present amendments.

As another example, *Hotelling* does not appear to disclose, teach, or suggest "the touch sensor comprising a plurality of capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in amended Claim 11. At best, the cited portions of *Hotelling* appear to disclose that each intersection of row and column traces represents a capacitive sensing node. *See Hotelling* at ¶36. However, even assuming for the sake of argument only that the intersection of row and column ITO traces in *Hotelling* could be equated to the claimed capacitive nodes (which the Office Action apparently asserts, but Applicant does not concede), the cited portions of *Hotelling* still would not disclose, teach, or suggest "capacitive nodes formed from drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in amended independent Claim 1. Instead, *Hotelling* discloses a sensor panel with row and column traces formed from ITO with separate metal traces connecting row traces to an edge of a substrate. Furthermore, *Hotelling* is silent regarding metal traces being configured to bend with a flexible substrate. The cited portions of *Grant* also do not appear to make up for at least the above-discussed deficiencies of *Hotelling*.

Moreover, Applicant does not admit that the proposed *Grant-Hotelling* combination is possible or that the Office Action provides an adequate reason, either from the cited references or from knowledge generally available to one of ordinary skill in the art at the time of Applicant's invention, to combine or modify the cited references in the proposed manner. Although due to at least the above-discussed deficiencies Applicant does not discuss this

issue in detail in this submission, Applicant reserves the right to discuss this issue in a future submission if appropriate.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 11 and its dependent claims.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicant does not acquiesce to those additional statements.

Conclusion

Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact Chad D. Terrell, Attorney for Applicant, at (214) 953-6813, at the Examiner's convenience.

Applicant believes no fees are due; however, the Commissioner is authorized to charge any necessary fees and credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

/Chad Terrell/

Chad D. Terrell
Reg. No. 52,279

Date: February 7, 2014

Correspondence Address:

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/284,674	10/28/2011	Esat Yilmaz	080900.0647	7554

12323 7590 11/07/2013

Baker Botts L.L.P.
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EXAMINER	
RIOS RUSSO, RAUL J	
ART UNIT	**PAPER NUMBER**
2867	

NOTIFICATION DATE	DELIVERY MODE
11/07/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/284,674	Applicant(s) YILMAZ ET AL.	
	Examiner RAUL RIOS RUSSO	Art Unit 4171	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 October 2011*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *28 October 2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/28/2011, 01/27/2012, 08/18/2012, 03/01/2013 and 04/23/2013*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 10/28/2011, 01/27/2012, 08/18/2012, 03/01/2013 and 04/23/2013 have been considered by the examiner.

Oath/Declaration

3. Oath/Declaration as file 10/28/2011 is noted by the Examiner.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting

ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

5. Claims 1, 2, 7, 11, 12 and 17 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 3, 12, 15, 17 and 26 of copending Application No. 13/198,579 (US 2013/0032414 A1). Although the claims at issue are not identical, they are not patentably distinct from each other because

The limitations of claim 1 are disclosed in claim 1 of the copending Application No. 13/198,579.

The limitations of claim 2 are disclosed in claim 3 of the copending Application No. 13/198,579.

The limitations of claim 7 are disclosed in claim 12 of the copending Application No. 13/198,579.

The limitations of claim 11 are disclosed in claim 15 of the copending Application No. 13/198,579.

The limitations of claim 12 are disclosed in claim 17 of the copending Application No. 13/198,579.

The limitations of claim 17 are disclosed in claim 26 of the copending Application No. 13/198,579.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claim Rejections - 35 USC § 103

6. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-20 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over **Grant et al. US 2008/0303782 A1 (hereinafter Grant)** in view of **Hotelling et al. US 2008/0158183 A1 (hereinafter Hotelling)**.

Regarding claim 1, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011])**, configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003])**.

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Regarding claims 2 and 12, the apparatus of Claims 1 and 11, Grant does teach wherein the touch sensor **(see at least Figs. 1A-1C; [0009-0011])** further comprises tracking disposed on the substantially flexible substrate **(Figs. 3-4 and the corresponding descriptions; 302 and 310; [0060-0063])** configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3, 4 and the corresponding descriptions; 302 and 310; [0060-0063])**.

Grant does not specifically teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes.

However, Hotelling does teach tracking disposed on the substantially flexible substrate configured to provide drive or sense connections **([0005-0006, 0008]; Flex circuits can be used to connect the column (sense) and row (drive) traces on either side of the sensor panel to its associated sensor panel circuitry)** to or from the drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces. Also, the columns must be connected to analog channels so that modulated output signals can be detected.

Regarding claims 3 and 13, Grant does not teach wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

However Hotelling does teach, the apparatus of Claims 2 and 12 wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh **([0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive

material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 4 and 14, the apparatus of Claims 3 and 13, Grant does not teach wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material (**[0008, 0035]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 5 and 15, the apparatus of Claims 1 and 11, Grant further teaches wherein the substantially flexible substrate is flat or curved **(Grant; Fig. 3; 302; flexible touch sensitive surface; the flexible touch sensitive surface is flat)**.

Regarding claims 6 and 16, the apparatus of Claims 1 and 11, Grant does not teach wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

However, Hotelling does teach wherein the touch sensor comprises:

a single-layer configuration **(Fig. 9; [0056]; single layer configuration of ITO)** with drive and sense electrodes **(see at least Figs. 1 and 2a; [0030-0033]; claim 9; sense and drive traces)** disposed only on a first surface of the substantially flexible substrate **(see at least Figs. 1 and 2a; [0030-0033]**); or

a two-layer configuration **(Figs. 3, 9; [0043, 0056];top and bottom layer of ITO for Fig. 3; and a second layer configuration of ITO can be added for Fig. 9)** with drive electrodes **(see at least Figs. 1 and 2a; [0008; 0030-0033]; claim 9; drive traces)** disposed on the first surface of the substantially flexible substrate **(Fig. 3; [0008, 0043]; claim 9; top layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** and sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9;**

sense traces) disposed on a second surface of the substrate opposite the first surface **(Fig. 3; [0008, 0043]; claim 9; bottom layer; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding the single-layer or double layer configuration as taught by Hotelling because layer configuration can be applied for the purpose of shielding, modulation and a uniform appearance.

Regarding claims 7 and 17, the apparatus of Claims 1 and 11, Grant further teaches wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor **([0071]; some touch surfaces detect inputs by measuring capacitance change in response to a touch; See also Hotelling; see at least Figs. 1-2; 124, 126; [0030-0033, 0035]).**

Regarding claims 8 and 18, the apparatus of Claims 1 and 11, Grant does not specifically teach wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

However, Hotelling does teach wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes **([0008, 0035]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate; traces made of copper or other highly conductive metals running along the edge of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 9 and 19, the apparatus of Claims 1 and 11, Grant does not specifically wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

However, Hotelling does teach wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material **([0008, 0035]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate; traces made of copper or other highly conductive metals running along the edge of the substrate**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be

bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claims 10 and 20, the apparatus of Claims 1 and 11, Grant does not specifically teach wherein the touch sensor further comprises electrically- isolated structures made of conductive material comprising a conductive mesh.

However, Hotelling does teach wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh **([0008, 0035]; The row and column traces can be formed from a transparent conductive medium such as ITO or ATO, although other transparent or non-transparent materials such as copper can also be used).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by using portions made of conductive material comprising a conductive mesh as taught by Hotelling since traces made of copper or other highly conductive metals running along the edge of the substrate can be used to bring the row traces to the same edge of the substrate as the column traces so that the flex circuits can be bonded to the same edge of the substrate on directly opposing sides of the substrate, minimizing the area needed for connectivity and reducing the overall size of the sensor panel.

Regarding claim 11, Grant does teach an apparatus **(Abstract)** comprising:

a substantially flexible substrate **(Abstract; flexible touch sensitive surface)**; and

a touch sensor disposed on the substantially flexible substrate **(see at least Figs. 1A-1C; [0009-0011]**), configured to bend with the substantially flexible substrate **(Figs. 1A-1C, 3 and the corresponding descriptions; [0003]**); as well as one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor **(Fig. 2; [0058]; Main memory 204, which may include multiple levels of cache memories, stores frequently used data and instructions. Main memory 204 may be RAM (random access memory), MRAM (magnetic RAM), or flash memory. Static memory 206 may be a ROM (read-only memory), which is coupled to bus 211, for storing static information and/or instructions).**

Grant does not specifically teach the touch sensor comprising drive or sense electrodes made of flexible conductive material.

However, Hotelling does teach a touch sensor comprising drive or sense electrodes **(see at least Figs. 1 and 2a; [0008, 0030-0033]; claim 9; sense traces formed on a first side of a dielectric substrate; and drive traces formed on a second side of the substrate)** made of flexible conductive material **([0008]; traces made of copper or other highly conductive metals running along the edge of the substrate).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the touch panel taught by Grant by adding drive or sense electrodes made of

flexible conductive material as taught by Hotelling since the sensor traces provide level shifting from a low voltage level to a higher voltage level, thus providing a better signal-to-noise ratio for improved noise reduction purposes while the drive traces provide shielding for the sense traces.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Yasutake US 5,729,249 - Input appts for contact type control unit e.g. crane generates control information pertaining to positive or negative direction, when pressure is applied on detector mounted on negative or positive coordinate axis.
- Long et al. US 2010/0045620 A1 - Integrated touch screen and display device has touch screen controller which is communicatively coupled to electrodes of conductive coating deposited over outer surface of front polarizer of display.
- Frey et al. US 2010/0156840 A1 - Touch screen sensor for electronic device e.g. computer, has electrically conductive micropattern provided with micropattern regions with different sheet resistance values.
- LE et al. US 2011/0018556 A1 - Toy automation device has capacitive proximity sensor that is disposed inside toy and is able to detect near contact of touch by human through intervening skin or covering of toy.
- Day et al. US 20100308844 A1 - Input device e.g. pointing device, for sensing stylus in sensing region of e.g. video game player, has pressure-sensitive layer for changing admittances in response to pressure applied to touch surface.

- Oba US 2008/0129317 A1 - Capacitive input device e.g. touch sensor for detecting capacitance variations has electrodes which are set on rear and front surfaces of base substrate, have same shape and same array, and are electrically connected to each other.
- Herrmann US 2012/0074961 A1 - Capacitive sensor circuit for use in touch sensor for household appliances, has amplifier which is connected between sense electrode and active shield electrode.
- Amm et al. US 2011/0012793 A1 - Electronic device e.g. tablet computer has capacitive proximity sensor electrode which is located between parasitic antenna resonating element and antenna window.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAUL RIOS RUSSO whose telephone number is (571)270-3459. The examiner can normally be reached on Monday-Friday; 8 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nitin Patel can be reached on (571)272-7677. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAUL RIOS RUSSO/
Examiner, Art Unit 4171

/Mohamad A Musleh/
Primary Examiner, Art Unit 2837

FLEXIBLE TOUCH SENSOR

TECHNICAL FIELD

[1] This disclosure generally relates to touch sensors.

BACKGROUND

[2] A touch-position sensor may detect the presence and location of a touch or the proximity of an object (such as a user's finger or a stylus) within a touch-sensitive area of the touch sensor overlaid on a display screen, for example. In a touch sensitive display application, the touch position sensor may enable a user to interact directly with what is displayed on the screen, rather than indirectly with a mouse or touch pad. A touch sensor may be attached to or provided as part of a desktop computer, laptop computer, tablet computer, personal digital assistant (PDA), smartphone, satellite navigation device, portable media player, portable game console, kiosk computer, point-of-sale device, or other suitable device. A control panel on a household or other appliance may include a touch sensor.

[3] There are a number of different types of touch position sensors, such as (for example) resistive touch screens, surface acoustic wave touch screens, and capacitive touch screens. Herein, reference to a touch sensor may encompass a touch screen, and vice versa, where appropriate. When an object touches or comes within proximity of the surface of the capacitive touch screen, a change in capacitance may occur within the touch screen at the location of the touch or proximity. A controller may process the change in capacitance to determine its position on the touch screen.

BRIEF DESCRIPTION OF THE DRAWINGS

[4] FIGURE 1 illustrates an example touch sensor with an example controller.

[5] FIGURES 2A-2B illustrate two example mesh patterns of a touch-sensitive mesh layer.

[6] FIGURES 3-6 illustrate example cut patterns in the example mesh of FIGURE 2A.

[7] FIGURE 7 illustrates an example mobile telephone that incorporates a flexible touch-sensitive apparatus.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[8] FIGURE 1 illustrates an example touch sensor 10 with an example controller 12. Herein, reference to a touch sensor may encompass a touch screen, and vice versa, where appropriate. Touch sensor 10 and controller 12 may detect the presence and location of a touch or the proximity of an object within a touch-sensitive area of touch sensor 10. Herein, reference to a touch sensor may encompass both the touch sensor and its controller, where appropriate. Similarly, reference to a controller may encompass both the controller and its touch sensor, where appropriate. Touch sensor 10 may include one or more touch-sensitive areas, where appropriate. Touch sensor 10 may include an array of drive and sense electrodes (or an array of electrodes of a single type) disposed on one or more substrates, which may be made of a dielectric material. Herein, reference to a touch sensor may encompass both the electrodes of the touch sensor and the substrate(s) that they are disposed on, where appropriate. Alternatively, where appropriate, reference to a touch sensor may encompass the electrodes of the touch sensor, but not the substrate(s) that they are disposed on.

[9] An electrode (whether a drive electrode or a sense electrode) may be an area of conductive material forming a shape, such as for example a disc, square, rectangle, other suitable shape, or suitable combination of these. One or more cuts in one or more layers of conductive material may (at least in part) create the shape of an electrode, and the area of the shape may (at least in part) be bounded by those cuts. In particular embodiments, the conductive material of an electrode may occupy approximately 100% of the area of its shape. As an example and not by way of limitation, an electrode may be made of indium tin oxide (ITO) and the ITO of the electrode may occupy approximately 100% of the area of its shape, where appropriate. In particular embodiments, the conductive material of an electrode may occupy approximately 5% of the area of its shape. As an example and not by way of limitation, an electrode may be made of fine lines of metal or other conductive material (such as for example copper, silver, or a copper- or silver-based material) and the fine lines of conductive material may occupy approximately 5% of the area of its shape in a hatched, mesh, or other suitable pattern. Although this disclosure describes or illustrates particular electrodes made of particular conductive material forming particular shapes with particular fills having particular patterns, this disclosure

contemplates any suitable electrodes made of any suitable conductive material forming any suitable shapes with any suitable fills having any suitable patterns. Where appropriate, the shapes of the electrodes (or other elements) of a touch sensor may constitute in whole or in part one or more macro-features of the touch sensor. One or more characteristics of the implementation of those shapes (such as, for example, the conductive materials, fills, or patterns within the shapes) may constitute in whole or in part one or more micro-features of the touch sensor. One or more macro-features of a touch sensor may determine one or more characteristics of its functionality, and one or more micro-features of the touch sensor may determine one or more optical features of the touch sensor, such as transmittance, refraction, or reflection.

[10] One or more portions of the substrate of touch sensor 10 may be made of polyethylene terephthalate (PET) or another suitable material. This disclosure contemplates any suitable substrate with any suitable portions made of any suitable material. In particular embodiments, the drive or sense electrodes in touch sensor 10 may be made of ITO in whole or in part. In particular embodiments, the drive or sense electrodes in touch sensor 10 may be made of fine lines of metal or other conductive material. As an example and not by way of limitation, one or more portions of the conductive material may be copper or copper-based and have a thickness of approximately 5 μm or less and a width of approximately 10 μm or less. As another example, one or more portions of the conductive material may be silver or silver-based and similarly have a thickness of approximately 5 μm or less and a width of approximately 10 μm or less. This disclosure contemplates any suitable electrodes made of any suitable material.

[11] A mechanical stack may contain the substrate (or multiple substrates) and the conductive material forming the drive or sense electrodes of touch sensor 10. As an example and not by way of limitation, the mechanical stack may include a first layer of optically clear adhesive (OCA) beneath a cover panel. The cover panel may be clear and made of a resilient material suitable for repeated touching, such as for example glass, polycarbonate, or poly(methyl methacrylate) (PMMA). This disclosure contemplates any suitable cover panel made of any suitable material. The first layer of OCA may be disposed between the cover panel and the substrate with the conductive material forming the drive or sense electrodes. The mechanical stack may also include a second layer of OCA and a dielectric layer (which may be made of PET

or another suitable material, similar to the substrate with the conductive material forming the drive or sense electrodes). As an alternative, where appropriate, a thin coating of a dielectric material may be applied instead of the second layer of OCA and the dielectric layer. The second layer of OCA may be disposed between the substrate with the conductive material making up the drive or sense electrodes and the dielectric layer, and the dielectric layer may be disposed between the second layer of OCA and an air gap to a display of a device including touch sensor 10 and controller 12. As an example only and not by way of limitation, the cover panel may have a thickness of approximately 1 mm; the first layer of OCA may have a thickness of approximately 0.05 mm; the substrate with the conductive material forming the drive or sense electrodes may have a thickness of approximately 0.05 mm; the second layer of OCA may have a thickness of approximately 0.05 mm; and the dielectric layer may have a thickness of approximately 0.05 mm. Although this disclosure describes a particular mechanical stack with a particular number of particular layers made of particular materials and having particular thicknesses, this disclosure contemplates any suitable mechanical stack with any suitable number of any suitable layers made of any suitable materials and having any suitable thicknesses. As an example and not by way of limitation, in particular embodiments, a layer of adhesive or dielectric may replace the dielectric layer, second layer of OCA, and air gap described above, with there being no air gap to the display.

[12] Touch sensor 10 may implement a capacitive form of touch sensing. In a mutual-capacitance implementation, touch sensor 10 may include an array of drive and sense electrodes forming an array of capacitive nodes. A drive electrode and a sense electrode may form a capacitive node. The drive and sense electrodes forming the capacitive node may come near each other, but not make electrical contact with each other. Instead, the drive and sense electrodes may be capacitively coupled to each other across a space between them. A pulsed or alternating voltage applied to the drive electrode (by controller 12) may induce a charge on the sense electrode, and the amount of charge induced may be susceptible to external influence (such as a touch or the proximity of an object). When an object touches or comes within proximity of the capacitive node, a change in capacitance may occur at the capacitive node and controller 12 may measure the change in capacitance. By measuring changes in capacitance throughout the

array, controller 12 may determine the position of the touch or proximity within the touch-sensitive area(s) of touch sensor 10.

[13] In a self-capacitance implementation, touch sensor 10 may include an array of electrodes of a single type that may each form a capacitive node. When an object touches or comes within proximity of the capacitive node, a change in self-capacitance may occur at the capacitive node and controller 12 may measure the change in capacitance, for example, as a change in the amount of charge needed to raise the voltage at the capacitive node by a pre-determined amount. As with a mutual-capacitance implementation, by measuring changes in capacitance throughout the array, controller 12 may determine the position of the touch or proximity within the touch-sensitive area(s) of touch sensor 10. This disclosure contemplates any suitable form of capacitive touch sensing, where appropriate.

[14] In particular embodiments, one or more drive electrodes may together form a drive line running horizontally or vertically or in any suitable orientation. Similarly, one or more sense electrodes may together form a sense line running horizontally or vertically or in any suitable orientation. In particular embodiments, drive lines may run substantially perpendicular to sense lines. Herein, reference to a drive line may encompass one or more drive electrodes making up the drive line, and vice versa, where appropriate. Similarly, reference to a sense line may encompass one or more sense electrodes making up the sense line, and vice versa, where appropriate.

[15] Touch sensor 10 may have drive and sense electrodes disposed in a pattern on one side of a single substrate. In such a configuration, a pair of drive and sense electrodes capacitively coupled to each other across a space between them may form a capacitive node. For a self-capacitance implementation, electrodes of only a single type may be disposed in a pattern on a single substrate. In addition or as an alternative to having drive and sense electrodes disposed in a pattern on one side of a single substrate, touch sensor 10 may have drive electrodes disposed in a pattern on one side of a substrate and sense electrodes disposed in a pattern on another side of the substrate. Moreover, touch sensor 10 may have drive electrodes disposed in a pattern on one side of one substrate and sense electrodes disposed in a pattern on one side of another substrate. In such configurations, an intersection of a drive electrode and a sense

electrode may form a capacitive node. Such an intersection may be a location where the drive electrode and the sense electrode "cross" or come nearest each other in their respective planes. The drive and sense electrodes do not make electrical contact with each other—instead they are capacitively coupled to each other across a dielectric at the intersection. Although this disclosure describes particular configurations of particular electrodes forming particular nodes, this disclosure contemplates any suitable configuration of any suitable electrodes forming any suitable nodes. Moreover, this disclosure contemplates any suitable electrodes disposed on any suitable number of any suitable substrates in any suitable patterns.

[16] As described above, a change in capacitance at a capacitive node of touch sensor 10 may indicate a touch or proximity input at the position of the capacitive node. Controller 12 may detect and process the change in capacitance to determine the presence and location of the touch or proximity input. Controller 12 may then communicate information about the touch or proximity input to one or more other components (such one or more central processing units (CPUs) or digital signal processors (DSPs)) of a device that includes touch sensor 10 and controller 12, which may respond to the touch or proximity input by initiating a function of the device (or an application running on the device) associated with it. Although this disclosure describes a particular controller having particular functionality with respect to a particular device and a particular touch sensor, this disclosure contemplates any suitable controller having any suitable functionality with respect to any suitable device and any suitable touch sensor.

[17] Controller 12 may be one or more integrated circuits (ICs)—such as for example general-purpose microprocessors, microcontrollers, programmable logic devices or arrays, application-specific ICs (ASICs)—on a flexible printed circuit (FPC) bonded to the substrate of touch sensor 10, as described below. Controller 12 may include a processor unit, a drive unit, a sense unit, and a storage unit. The drive unit may supply drive signals to the drive electrodes of touch sensor 10. The sense unit may sense charge at the capacitive nodes of touch sensor 10 and provide measurement signals to the processor unit representing capacitances at the capacitive nodes. The processor unit may control the supply of drive signals to the drive electrodes by the drive unit and process measurement signals from the sense unit to detect and process the presence and location of a touch or proximity input within the touch-sensitive area(s) of touch

sensor 10. The processor unit may also track changes in the position of a touch or proximity input within the touch-sensitive area(s) of touch sensor 10. The storage unit may store programming for execution by the processor unit, including programming for controlling the drive unit to supply drive signals to the drive electrodes, programming for processing measurement signals from the sense unit, and other suitable programming, where appropriate. Although this disclosure describes a particular controller having a particular implementation with particular components, this disclosure contemplates any suitable controller having any suitable implementation with any suitable components.

[18] Tracks 14 of conductive material disposed on the substrate of touch sensor 10 may couple the drive or sense electrodes of touch sensor 10 to bond pads 16, also disposed on the substrate of touch sensor 10. As described below, bond pads 16 facilitate coupling of tracks 14 to controller 12. Tracks 14 may extend into or around (e.g. at the edges of) the touch-sensitive area(s) of touch sensor 10. Particular tracks 14 may provide drive connections for coupling controller 12 to drive electrodes of touch sensor 10, through which the drive unit of controller 12 may supply drive signals to the drive electrodes. Other tracks 14 may provide sense connections for coupling controller 12 to sense electrodes of touch sensor 10, through which the sense unit of controller 12 may sense charge at the capacitive nodes of touch sensor 10. Tracks 14 may be made of fine lines of metal or other conductive material. As an example and not by way of limitation, the conductive material of tracks 14 may be copper or copper-based and have a width of approximately 100 μm or less. As another example, the conductive material of tracks 14 may be silver or silver-based and have a width of approximately 100 μm or less. In particular embodiments, tracks 14 may be made of ITO in whole or in part in addition or as an alternative to fine lines of metal or other conductive material. Although this disclosure describes particular tracks made of particular materials with particular widths, this disclosure contemplates any suitable tracks made of any suitable materials with any suitable widths. In addition to tracks 14, touch sensor 10 may include one or more ground lines terminating at a ground connector (which may be a bond pad 16) at an edge of the substrate of touch sensor 10 (similar to tracks 14).

[19] Bond pads 16 may be located along one or more edges of the substrate, outside the touch-sensitive area(s) of touch sensor 10. As described above, controller 12 may be on an FPC. Bond pads 16 may be made of the same material as tracks 14 and may be bonded to the FPC using an anisotropic conductive film (ACF). Connection 18 may include conductive lines on the FPC coupling controller 12 to bond pads 16, in turn coupling controller 12 to tracks 14 and to the drive or sense electrodes of touch sensor 10. This disclosure contemplates any suitable connection 18 between controller 12 and touch sensor 10.

[20] FIGURES 2A-2B illustrate two example mesh patterns of a touch-sensitive mesh layer. As discussed above, an electrode may be made of fine lines 22A-B of metal or other conductive material (e.g., copper, silver, or a copper- or silver-based material) and the lines 22A-B of conductive material may occupy the area of the electrode shape in a hatched, mesh, or other suitable pattern. In the example of FIGURE 2A, an example mesh pattern 20 of a touch-sensitive mesh layer may be formed from substantially straight lines 22A-B of conductive material. Mesh pattern 20 may be formed using two sets 22A-B of substantially parallel lines of conductive material. Mesh pattern 20 may be made up of an array of diamond-shaped mesh cells 24 formed from substantially orthogonal intersections between lines 22A with lines 22B of conductive material. As an example and not by way of limitation, first set 22A and second set 22B of conducting lines may be disposed such that a total line density is less than approximately 10% of a surface area. Thus, the contribution of the conductive lines to the reduction of transmission of light through mesh pattern 20 may be less than approximately 10%. Accordingly, although conductive lines 22A-B may be opaque, the combined optical transmittance of electrodes formed using mesh pattern 20 may be approximately 90% or higher ignoring reduction in transmittance due to other factors such as the substantially flexible substrate material.

[21] In the example of FIGURE 2B, mesh pattern 26 may be formed from substantially non-linear conductive lines 28A-B. Non-linear line patterns 28A-B may be used to avoid long linear stretches of fine metal with a repeat frequency, reducing a probability of causing interference or moiré patterns. The non-linear pattern of the conductive lines 28A-B of mesh pattern 26 may disperse and hence reduce the visibility of reflections from conductive lines 28A-

B when illuminated by incident light. As an example and not by way of limitation, each of conductive lines 28A-B of mesh pattern 26 may have a substantially sinusoidal shape. Mesh pattern 26 may be made up of an array of mesh cells 29 formed from non-orthogonal intersections between lines 26A with lines 26B of conductive material. Although this disclosure describes or illustrates particular mesh patterns, this disclosure contemplates any suitable mesh pattern formed using conductive lines with any suitable configuration.

[22] FIGURES 3-6 illustrate example cut patterns in example mesh pattern of FIGURE 2A. In the examples of FIGURE 3-6, macro-features (e.g., electrodes) of the touch sensor may be formed through cuts made in a mesh pattern of lines of conductive material. A cut pattern 30 may be formed through horizontal cuts 32 and vertical cuts 34 with orthogonal intersections. In particular embodiments, cut pattern 30 with interdigitated substantially rectangular projections may be defined through horizontal cuts 32 and vertical cuts 34. As an example and not by way of limitation, cut pattern 30 with interdigitated projections may approximately correspond to projections of a sense electrode interdigitated with projections of a corresponding drive electrode. Using interdigitated electrode projections may increase a number of capacitive coupling edges between sense electrodes and corresponding drive electrodes. As another example, cut pattern 30 with interdigitated projections may approximately correspond to projections of a sense electrode interdigitated with projections of a corresponding drive electrode disposed on different layers. Using interdigitated electrode projections may increase a number of capacitive coupling edges between sense electrodes and corresponding drive electrodes.

[23] In the example of FIGURE 4, a cut pattern 40 may be defined using vertical cuts 42 and angled cuts 44. Cut pattern 40 with interdigitated saw-tooth projections having non-orthogonal intersections may be defined through a substantially repeating pattern of vertical cuts 42 and angled cuts 44. As an example and not by way of limitation, cut pattern 40 may approximately correspond to electrodes using angled cuts 44 to increase a length of coupling edges between interdigitated projections of sense electrodes and corresponding drive electrodes. In the example of FIGURE 5, horizontal cuts 52A-B and vertical cuts 54 may define a cut pattern 50 with alternating substantially rectangular projections. In particular embodiments, horizontal cuts 52A-B and vertical cuts 54 may define cut pattern 50 with projections having a width

defined by the dimension of horizontal cuts 52A-B. A substantially rectangular projection may have a width defined by horizontal cuts 52A and another substantially rectangular projection may have a width defined by horizontal cuts 52B. As an example and not by way of limitation, cut pattern 50 may approximately correspond to alternating electrodes with differing widths, which may reduce interference patterns. In the example of FIGURE 6, horizontal cuts 62 and angled cuts 64 may form a cut pattern 60 using non-orthogonal intersections to define interdigitated projections substantially in the shape of parallelograms. As an example and not by way of limitation, cut pattern 60 may approximately correspond to an electrode pattern with substantially parallelogram projections. Although this disclosure describes or illustrates particular cut patterns in a particular mesh pattern, this disclosure contemplates any suitable cut pattern made on any suitable mesh pattern including, but not limited to, bars and triangles.

[24] In particular embodiments, micro-features (e.g. in-fill structures) of the touch sensor may be formed through cuts made in the mesh pattern of conductive material. Filling in gaps or voids using in-fill structures may reduce a number of areas with optical discontinuities visible when viewing an underlying display. In particular embodiments, gaps between adjacent electrodes or voids within electrodes may be substantially filled using in-fill structures of electrically isolated conductive material. The isolated in-fill shapes may serve to visually obscure an electrode pattern, while having a minimal impact on the fringing fields between adjacent electrodes. Therefore, using in-fill structures may have electric field distributions substantially similar to electric field distributions without in-fill structures. As an example and not by way of limitation, in-fill structures may be a series of electrically isolated squares formed using horizontal and vertical cuts in a mesh pattern. Although this disclosure describes or illustrates particular in-fill shapes having particular patterns, this disclosure contemplates any suitable in-fill shapes having any suitable patterns.

[25] FIGURE 7 illustrates an example mobile telephone that incorporates a flexible touch-sensitive apparatus. In the example of FIGURE 7, example mobile telephone 600 incorporates a touch-sensitive apparatus 612 wrapped around an example display 613. Substrate 602 may include or have attached to it tracking areas, which may include tracks providing drive and sense connections to and from the drive and sense electrodes of touch-sensitive apparatus

612. In particular embodiments, an electrode pattern of touch-sensitive apparatus 612 made from metal-mesh technology with a copper, silver, or other suitable metal mesh, as described above. Substrate 602 may have the electrode pattern disposed on a surface. Substrate 602 and the conductive material of the electrode pattern may be flexible, enabling the conductive material to wrap around the left and right edges of the surface to left-side and right-side surfaces. For sharper edges (e.g., with radii of less than 1 mm), the flexible conductive material of the electrode pattern may be thicker or wider at the sharper edges than at the flat portions of surfaces. In particular embodiments, the electrode pattern may wrap around an edge 603 of example mobile phone 600. In other particular embodiments, touch-sensitive apparatus 612 may be wrapped around a curved surface. The curved surface may be curved in one dimension or in two dimensions. As an example and not by way of limitation, touch-sensitive apparatus 612 may be wrapped over surfaces that are substantially perpendicular to each other or, if there is no substantial distinction between surfaces (such as, for example, a pebble-shaped or curved device), an angle of deviation between the surfaces of 45° or greater. Although this disclosure describes and illustrates a particular use of touch-sensitive apparatus 612 in a particular device, this disclosure contemplates any suitable use of touch-sensitive apparatus 612 in any suitable device.

[26] Example display 613 may be a liquid crystal display (LCD), a light-emitting diode (LED) display, an LED-backlight LCD, or other suitable display and may be visible though cover panel 601 and substrate 602, as well as the electrode pattern disposed on substrate 602. Although this disclosure describes and illustrates a particular display and particular display types, this disclosure contemplates any suitable device display and any suitable display types.

[27] Herein, reference to a computer-readable storage medium encompasses one or more non-transitory, tangible computer-readable storage media possessing structure. As an example and not by way of limitation, a computer-readable storage medium may include a semiconductor-based or other ICs (such, as for example, a field-programmable gate array (FPGA) or ASICs), a hard disk, an HDD, a hybrid hard drive (HHD), an optical disc, an optical disc drive (ODD), a magneto-optical disc, a magneto-optical drive, a floppy disk, a floppy disk drive (FDD), magnetic tape, a holographic storage medium, a solid-state drive (SSD), a RAM-

drive, a SECURE DIGITAL card, a SECURE DIGITAL drive, or another suitable computer-readable storage medium or a combination of two or more of these, where appropriate. Herein, reference to a computer-readable storage medium excludes any medium that is not eligible for patent protection under 35 U.S.C. § 101. Herein, reference to a computer-readable storage medium excludes transitory forms of signal transmission (such as a propagating electrical or electromagnetic signal per se) to the extent that they are not eligible for patent protection under 35 U.S.C. § 101. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

[28] Herein, "or" is inclusive and not exclusive, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A or B" means "A, B, or both," unless expressly indicated otherwise or indicated otherwise by context. Moreover, "and" is both joint and several, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A and B" means "A and B, jointly or severally," unless expressly indicated otherwise or indicated otherwise by context.

[29] This disclosure encompasses all changes, substitutions, variations, alterations, and modifications to the example embodiments herein that a person having ordinary skill in the art would comprehend. Similarly, where appropriate, the appended claims encompass all changes, substitutions, variations, alterations, and modifications to the example embodiments herein that a person having ordinary skill in the art would comprehend. Moreover, reference in the appended claims to an apparatus or system or a component of an apparatus or system being adapted to, arranged to, capable of, configured to, enabled to, operable to, or operative to perform a particular function encompasses that apparatus, system, component, whether or not it or that particular function is activated, turned on, or unlocked, as long as that apparatus, system, or component is so adapted, arranged, capable, configured, enabled, operable, or operative.

WHAT IS CLAIMED IS:

1. An apparatus comprising:

a substantially flexible substrate; and

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate.

2. The apparatus of Claim 1, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

3. The apparatus of Claim 2, wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

4. The apparatus of Claim 3, wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

5. The apparatus of Claim 1, wherein the substantially flexible substrate is flat or curved.

6. The apparatus of Claim 1, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

7. The apparatus of Claim 1, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

8. The apparatus of Claim 1, wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

9. The apparatus of Claim 8, wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

10. The apparatus of Claim 1, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

11. A device comprising:

a substantially flexible substrate;

a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

12. The device of Claim 11, wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate.

13. The device of Claim 12, wherein one or more portions of the touch sensor are made of conductive material comprising a conductive mesh.

14. The device of Claim 13, wherein the conductive mesh is made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

15. The device of Claim 11, wherein the substantially flexible substrate is flat or curved.

16. The device of Claim 11, wherein the touch sensor comprises:

a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or

a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface.

17. The device of Claim 11, wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor.

18. The device of Claim 11, wherein the flexible conductive material of the drive or sense electrodes of the touch sensor comprises one or more conductive meshes.

19. The device of Claim 18, wherein one or more of the conductive meshes are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material.

20. The device of Claim 11, wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh.

ABSTRACT

In one embodiment, an apparatus include a substantially flexible substrate and a touch sensor disposed on the substantially flexible substrate. The touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate.

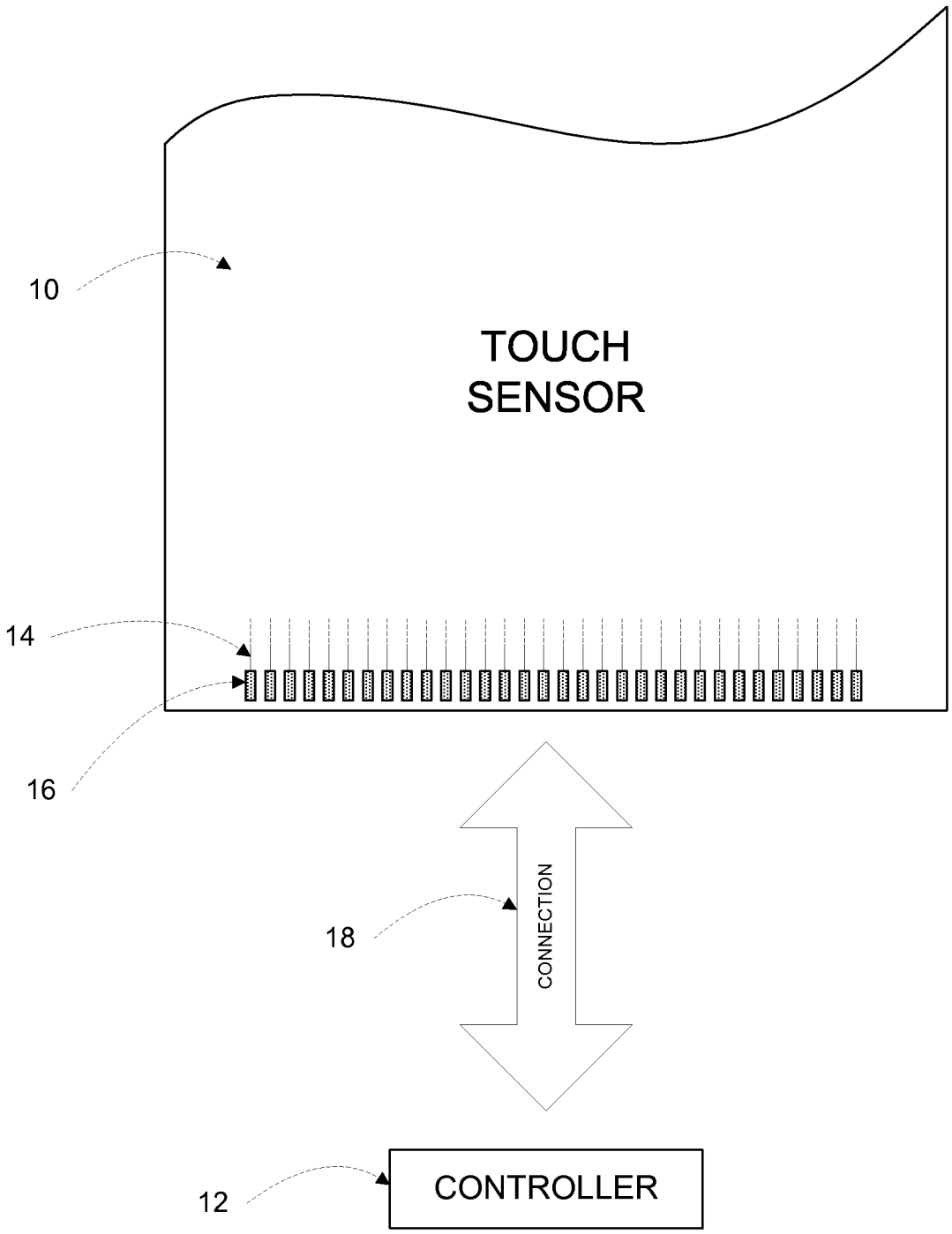

Figure 1 of 7

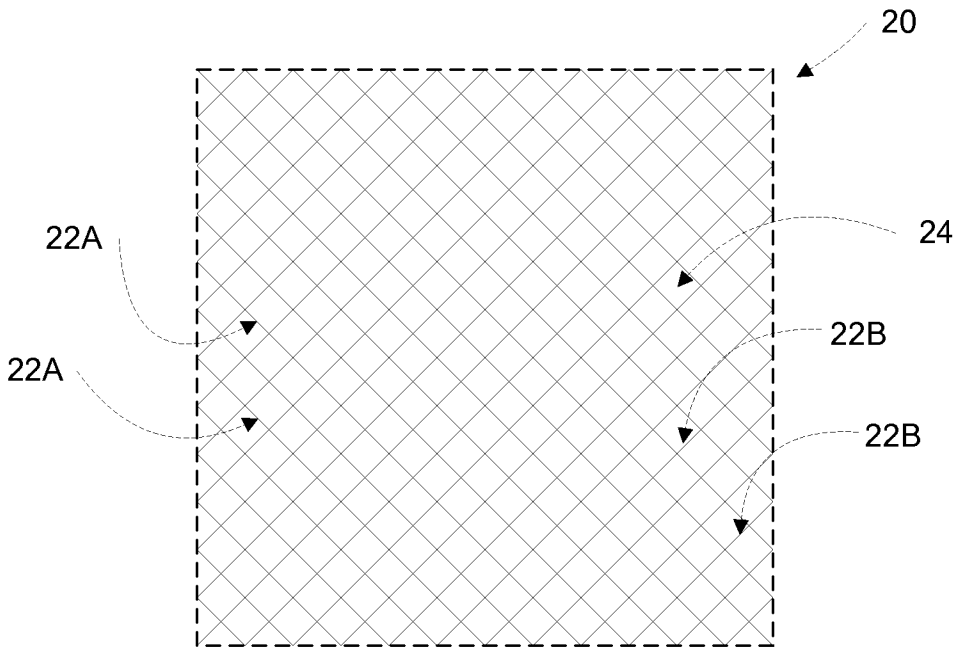

Figure 2A of 7

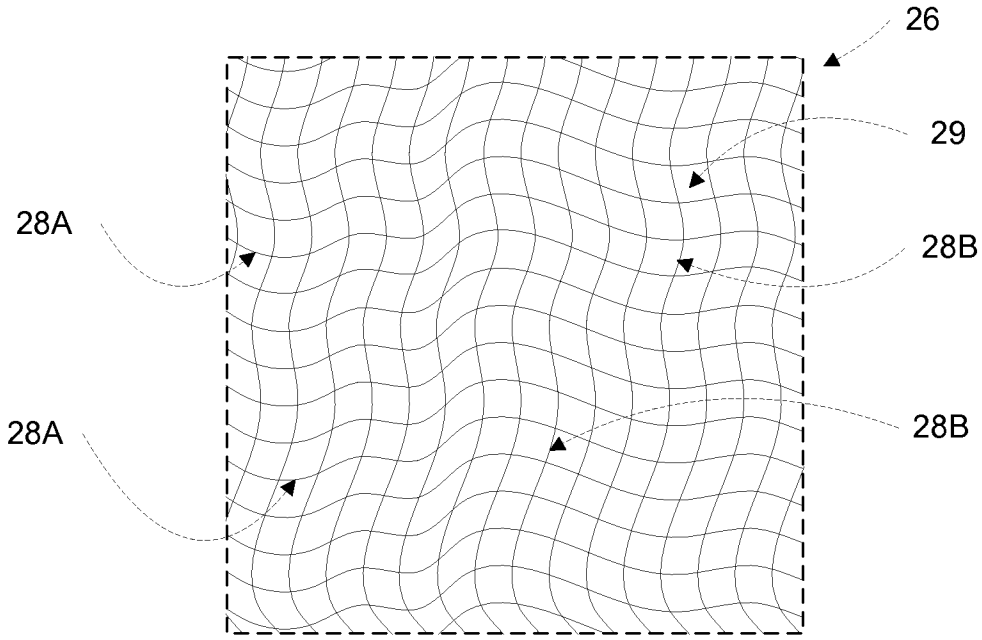

Figure 2B of 7

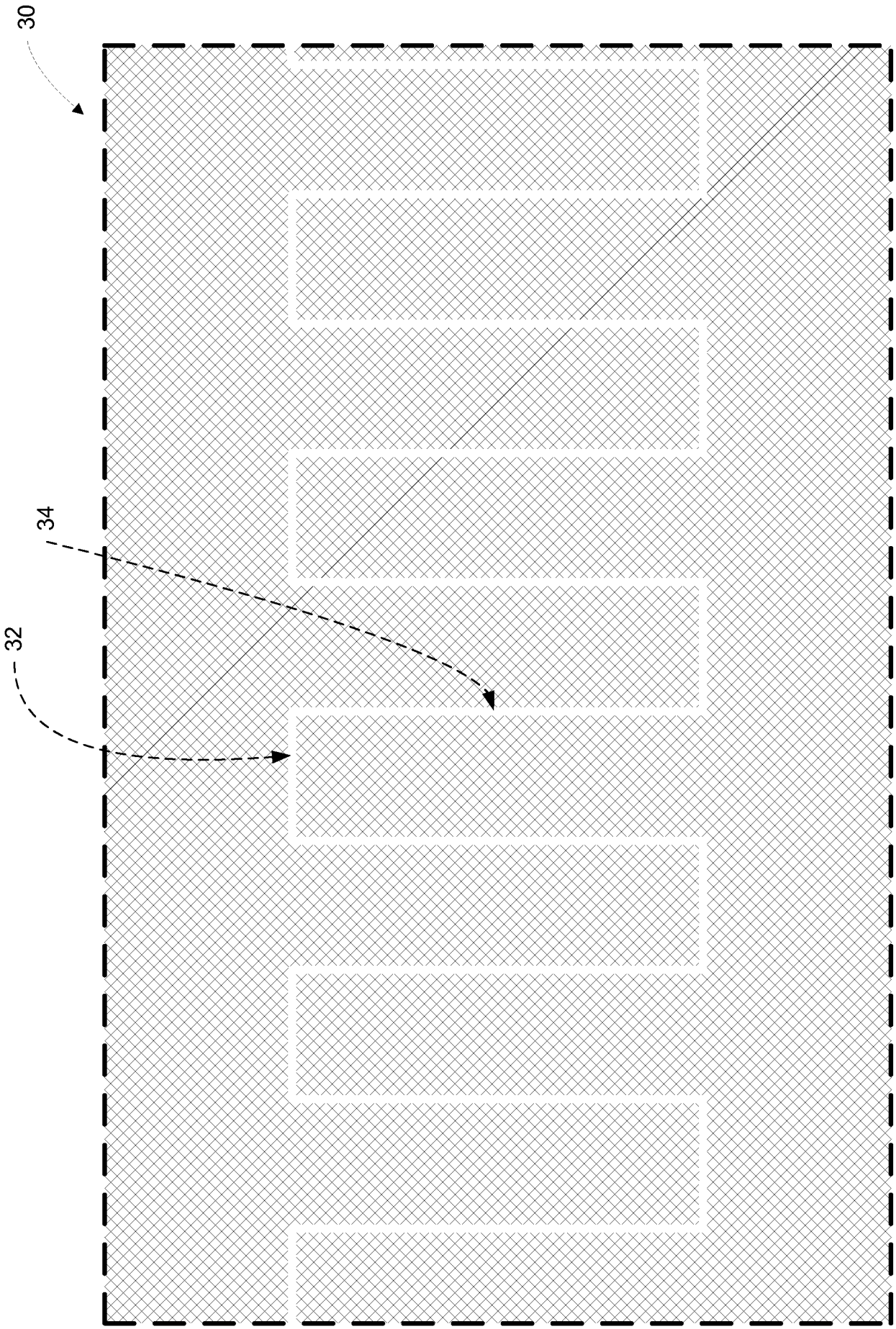

Figure 3 of 7

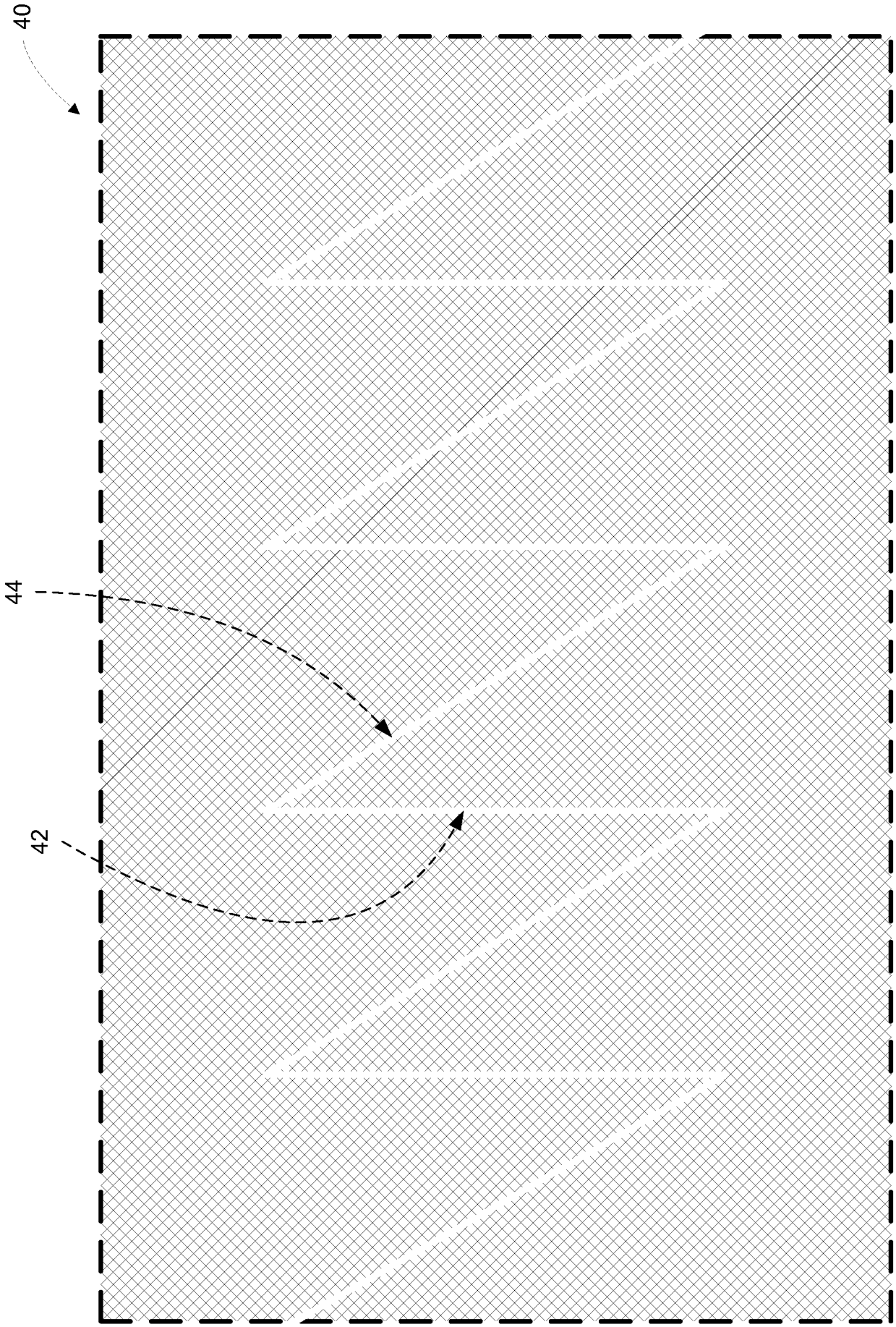

Figure 4 of 7

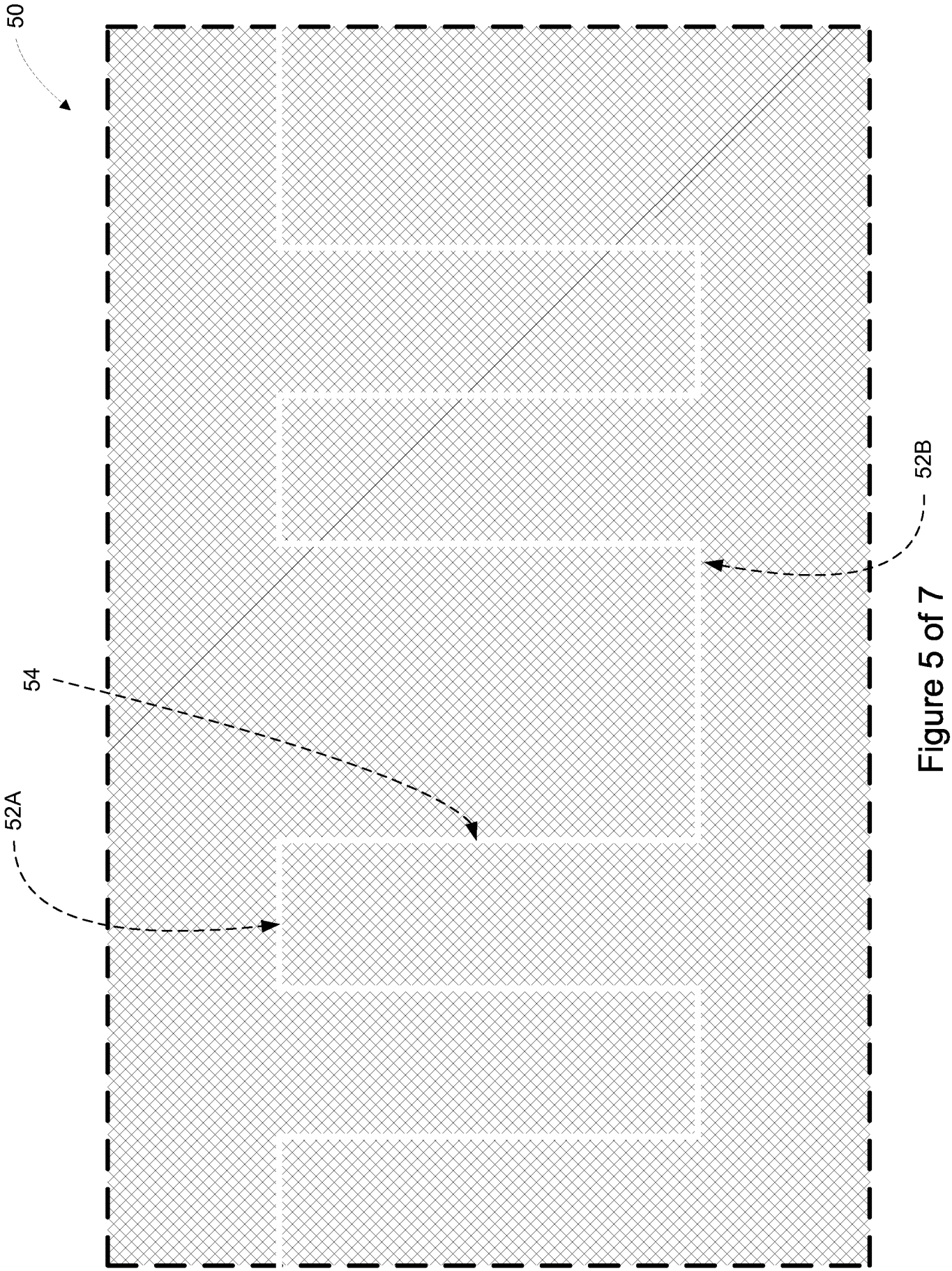

Figure 5 of 7

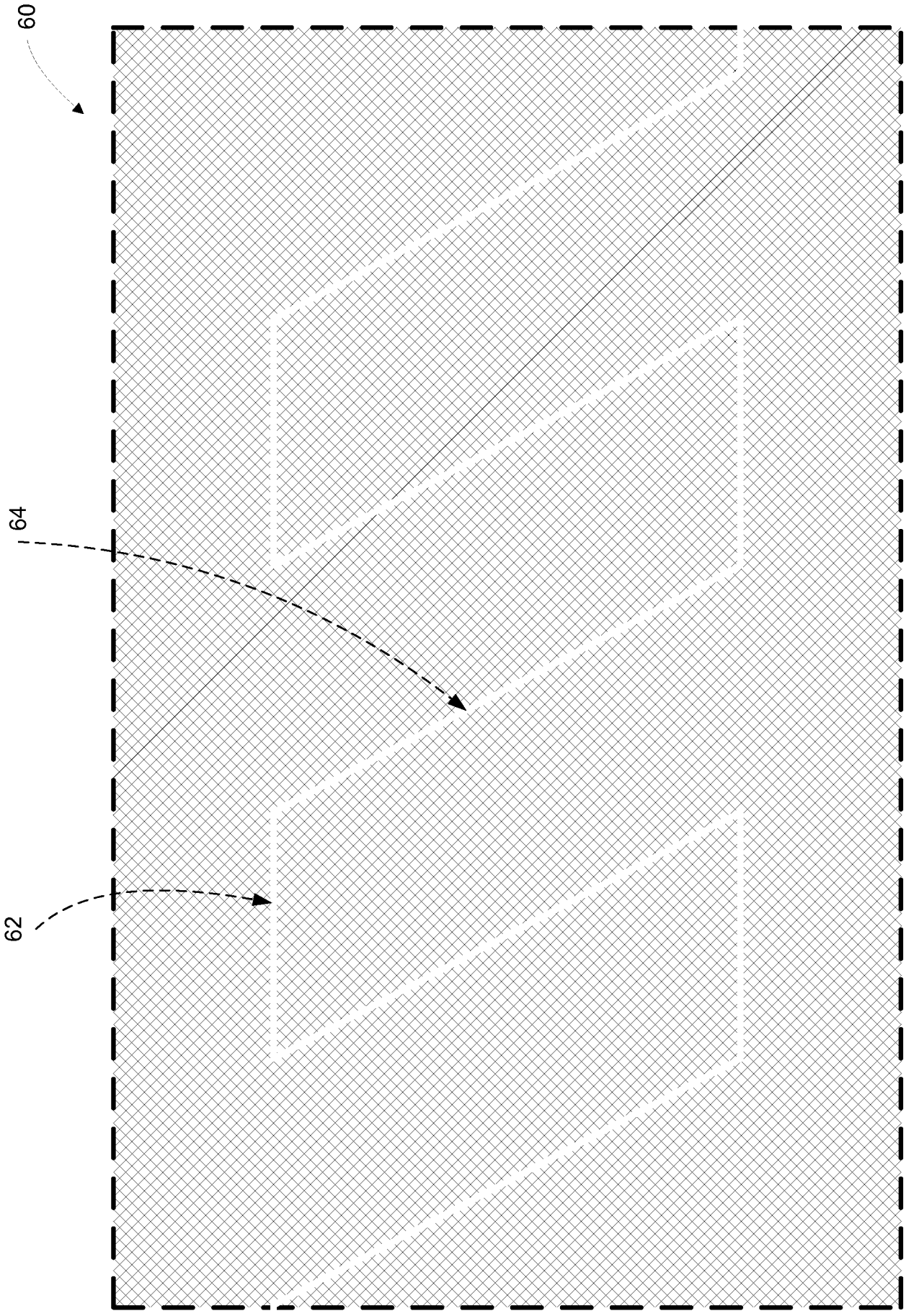

Figure 6 of 7

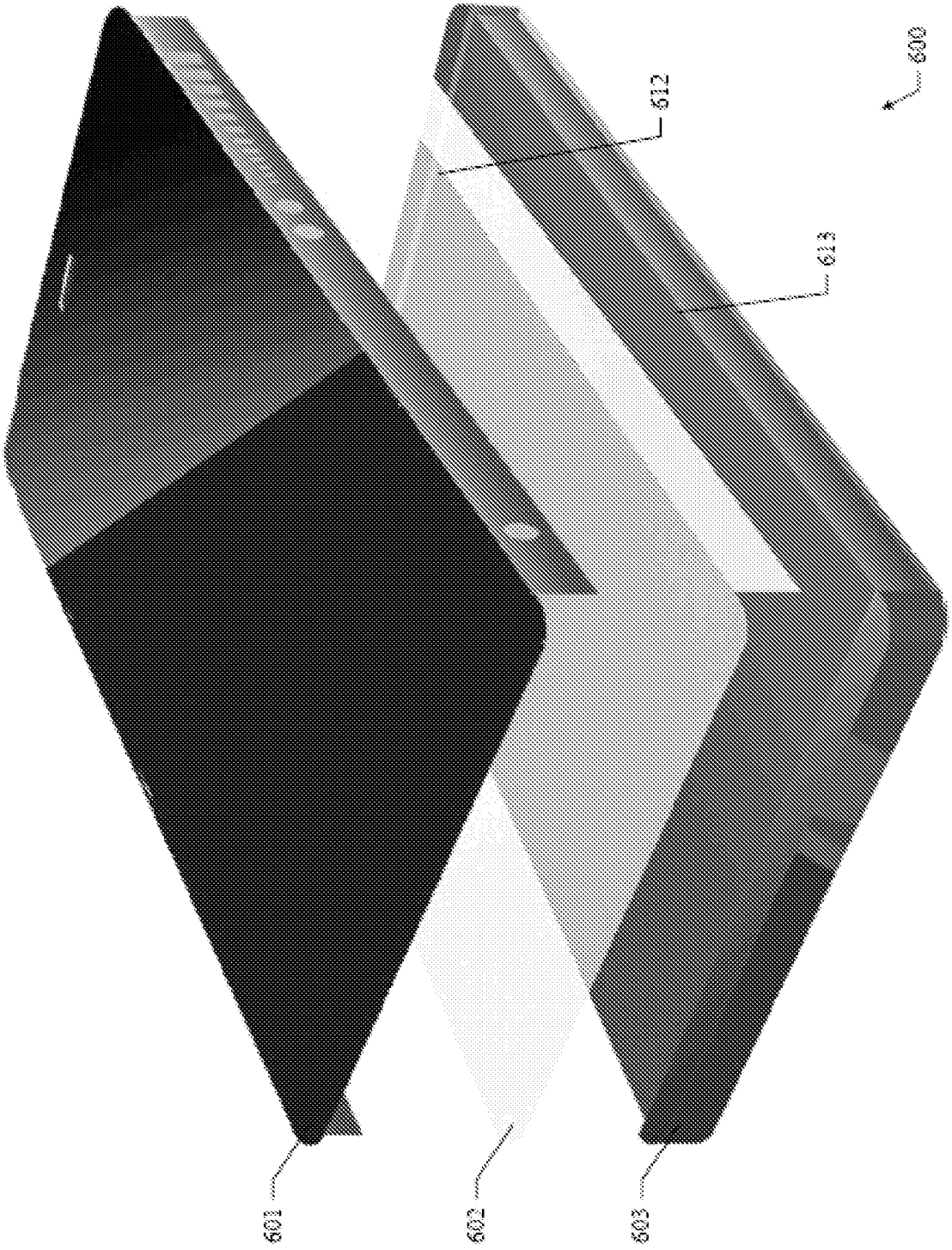

Figure 7 of 7